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U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

REPORT NO. 971

DEVELOPMENT OF AIRCRAFT ROCKET FUZES

18th Partial Report

- - - - - - - - - - - - - - - - - - - -

AIRCRAFT ROCKET FUZES;
XR-51A, XR-8D, AND EX-108;
DEVELOPMENT OF

FINAL Report

Task Assignment NPG-Re2b-11-1-52

Copy No. 19

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Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108;
Development of

PART A

SYNOPSIS

1. One of the aircraft rocket fuzes currently being developed at the Naval Ordnance Laboratory is the XR-51A. It is being considered for use in a proposed round consisting of a 5"0 HPAG motor and a new 5"0 A.P. head. It is also being considered for a rocket to be launched underwater. Concurrently the EX-108 fuze is being developed by the Naval Ordnance Test Station for similar usage.

2. a. The tests conducted on the XR-51A rocket fuze had three prime functions:

(1) To determine the ability of the fuze to withstand heavy plate impacts at velocities of 1800 and 2800 ft./sec.

(2) To determine the functioning sensitivity when subjected to light plate impacts at velocities of 1800 ft./sec.

(3) To determine the arming distance when used in combination with motors at various temperatures.

b. The EX-108 fuze body was tested against a heavy plate target to determine its ability to withstand a heavy plate impact at 2300 ft./sec.

3. It is concluded that:

a. XR-51A fuze bodies made from 4140 steel will withstand any impacts to which they might be subjected in service. They were fired against 3" STS at 1800 ft./sec., 4" Class B at 1950 ft./sec., and 6" Class B armor plate at 2400 and 2800 ft./sec. (all at 0° obliquity) with the fuzes recovered in good condition in all cases. Dural fuze bodies broke up and the threads on 1137 steel bodies sheared when subjected to 3" armor plate impacts at 1750 ft./sec.

b. The XR-51A fuze as presently designed and constructed will not meet the requirement of consistent functioning after 1/8" or 1/4" mild steel plate impact. Only one of eight fired at 1800 ft./sec. against 1/8" mild steel functioned (30° obliquity impact) and two of seven fired against 1/4" mild steel at 0° obliquity functioned.

Several rounds failing to fire after the steel target impact were reported to have functioned upon water impact 400 feet beyond the target where they may have been subjected to a more severe deceleration.

c. The limited tests conducted indicate that a reduction in the pressure orifice from ∇009 diameter to ∇008 diameter will supply the required minimum arming distance of 400 feet from the launching point, at temperatures ranging from -30°F to 120°F. Although one of the six arming devices tested with an ∇008 diameter orifice functioned just short of the 400 ft. minimum distance (390 feet) it is believed that the friction and inertia in the plunger movement required to complete arming in an assembled fuze would extend this distance sufficiently to meet the requirements.

4. It is recommended that the plate sensitivity tests be continued after the following steps have been taken:

a. Fire several XR-51A fuzes in smoke puff loaded rounds against 1/2" STS plate to see if consistent functioning will result.

b. If the fuze functions consistently on 1/2" plate reduce the friction between the plunger and fuze body by undercutting the plunger's circumference to leave a narrow bourrelet at its forward and after ends. Test some of the modified fuzes on various plate thicknesses.

c. If consistent functioning is not obtained on 1/2" plate, as described in 4 (a) above, fire several rounds containing XR-51A fuzes (inert except for primer, delay elements, and lead-ins) for recovery and examination.

Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108;
Development of

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Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108;
Development of

- -

PART B

INTRODUCTION

1. AUTHORITY:

The tests described herein were authorized by Task Assignment NPG-Re2b-11-1-52, reference (a), and fired in accordance with test directive reference (c) and shoot requests listed as references (b) and (d) through (n). Although the test directive also covered XR-8 fuzes, none were submitted for test at this time.

2. REFERENCES:

a. BUORD Conf ltr NP9-Re2b-DBLaP:bjn Ser 23965 of 4 August 1951
b. NOL unofficial memo WA:RSM:mbw of 12 July 1951
c. NOL Conf ltr NP/NOL/X1-1(850) DF:GDB Ser 01347 of 28 July 1951
d. NOL unofficial memo WA:RSM:mbw of 6 August 1951
e. NOL Conf ltr NP/NOL/X1-1(1038) WA:LJdeS Ser 01496 of 24 August 1951
f. NOL Conf ltr WA:RSM:eb of 9 September 1951
g. NOL Conf ltr NP/NOL/X1-1(1115) WA:RSM:eb Ser 01585 of 10 September 1951
h. NOL Conf ltr NP/NOL/X1-1(1211) Ser 01738 of 28 September 1951
i. NOL Conf ltr WA:RG:dmm of 4 October 1951
j. NOL Conf ltr NP/NOL/X1-1(1400) DF:FCK:dlg Ser 02058 of 8 November 1951
k. NPG Work Request from NOL WA-1 of 20 November 1951
l. NPG Work Request from NOL WA-2 of 21 November 1951.
m. NPG Work Request from NOL WA-6 of 22 January 1952
n. NPG Work Request from NOL WA-10 of 11 February 1952

3. BACKGROUND:

One of the aircraft rocket fuzes currently being developed at the Naval Ordnance Laboratory is the XR-51A. It is being considered for use in a proposed round consisting of a 5"0 HPAG motor and a new 5"0 A.P. head. It is also being considered for a rocket to be launched underwater. Concurrently the EX-108 fuze is being developed by the Naval Ordnance Test Station for similar usage.

4. OBJECT OF TEST:

a. The tests conducted on the XR-51A rocket fuse had three prime functions:

(1) To determine the ability of the fuse to withstand heavy plate impacts at velocities of 1800 and 2800 ft./sec.

(2) To determine the functioning sensitivity when subjected to light plate impacts at velocities of 1800 ft./sec.

(3) To determine the arming distance when used in combination with motors at various temperatures.

b. The EX-108 fuse body was tested against a heavy plate target to determine its ability to withstand a heavy plate impact at 2300 ft./sec.

5. PERIOD OF TEST:

a.	Date Project Letter	28 July 1951
b.	Dates Necessary Material Received	13 July 1951 30 July 1951 3 August 1951 15 August 1951 7 September 1951 14 September 1951 26 November 1951 23 January 1952 13 February 1952
c.	Date Commenced Test	23 July 1951
d.	Test Completed	15 February 1952

6. REPRESENTATIVES PRESENT:

J. A. Templeton	Naval Ordnance Laboratory
L. J. DeSabla	Naval Ordnance Laboratory
R. S. March	Naval Ordnance Laboratory

Aircraft Rocket Fuzes; XR-51A, XR-8D, and EX-108;
Development of

PART C

DETAILS OF TEST

7. DESCRIPTION OF ITEM UNDER TEST:

a. The XR-51A is a mechanical type base fuze intended for air-to-ground work in a 5" A.P. rocket head. It may possibly be employed in a rocket to be launched underwater.

b. Figure 1 is a general arrangement drawing of the fuze. It arms as a result of the introduction of motor gas pressure into the fuze followed by the action of creep force to move the plunger into firing position and line up the firing train. A 5 millisecond ±25% delay after impact is obtained by the use of a pyrotechnic delay train. Dual ignition into the booster is provided to insure functioning. The entire booster end of the fuze is waterproofed by being enclosed in a metal cup, rolled into a groove and soldered in place.

c. The pressure arming system was used by itself in the flight arming tests, as shown in Figure 11. Motor gas enters the fuze through a filter in the base. It then bleeds into an inner chamber through a small orifice (.009 diameter for the first tests and .008 diameter for the last test). When sufficient pressure has been accumulated the diaphragm is extended. In these test fixtures extension of the diaphragm drives a firing pin into the detonator which in turn initiates the firing of a smoke puff. However in the actual fuze, extension of the diaphragm is only the first step in the arming cycle since it rotates the plunger and moves it forward.

d. Fuze bodies made of various materials were tested in 6" A.P. projectiles Mk 35 Mod 5 having their diameter built up to 6.248 by the addition of cold rolled steel bands at the bourrelet and tail, as shown in Figure 2. In the initial tests the windshield and cap were removed to reduce weight and simulate the proposed design of armor piercing rocket head as closely as possible (it was believed that these items would not be incorporated in a rocket head). When it was found that the projectiles would break up in penetrating the desired plate thickness without the cap and windshield, they were left in place for later tests.

8. DESCRIPTION OF TEST EQUIPMENT:

a. Launchers

(1) NPG 105C ft. launcher

(2) Mk 31 launcher

(3) 6"25 smoothbore gun Mk 16-0 No. 1198

b. Propulsion

(1) 5" motors Mk 2 Mod 3

(2) 5" motors HPAG Model 116C

(3) Powder Charge for gun: 33.85 lbs. SPDN 3452

c. Test Vehicles

(1) 5" rocket heads Mk 2 Mod 2

(2) 5" rocket heads Mk 6 Mod 1

(3) 5" rocket heads EX-9

(4) 6" A.P. Projectile Mk 35 Mod 5 (built up to 6"248 diameter with steel bands -- 1" wide on forward bourrelet and 3/4" wide on tail)

d. Targets

(1) 1/8", 3/16", 1/4" mild steel

(2) 2" and 3" STS armor plate

(3) 4" and 6" Class B armor plate

e. Cameras

(1) Bowen Camera

(2) Mitchell Camera

(3) 35mm Fastax

f. Controlled temperature rooms (-35°F to +125°F)

9. PROCEDURE:

a. Heavy Plate Impact Tests

(1) NPG 1050 ft. launcher

Fuze bodies of various materials were tested to find a body that would withstand heavy impacts and still be suitable for large scale production. The fuzes were inserted in inert loaded, semi-armor piercing 5" rocket heads Mk 2 and fired through the heaviest armor plate the heads would penetrate in effective condition (3" STS at 0° obliquity and 2" STS at 30°). They were propelled from the 1050 ft. rocket launcher by a 5" HVAR motor, boosted to approximately 500 ft. per second before ignition by means of a second 5" HVAR motor. The heads were recovered in a sandpile immediately behind the targets.

(2) Inasmuch as these fuses are intended for use in an armor-piercing rocket head now under development at the Naval Proving Ground, which will penetrate a heavier target at a higher velocity than the existing 5" SAP head, it was desirable to test the fuses under these more severe conditions. A method was devised of firing the fuses from a 6"25 smoothbore gun (which did not impose any rotational acceleration) at 2800 ft./sec., the approximate terminal velocity of a round fired from an aircraft with a 5" HPAG motor. Standard 6" A.P. projectiles Mk 35 Mod 5 were modified by building up the diameter to 6"248 by sweating on a 1" wide, mild steel band at the forward bourrelet and a 3/4" wide band on the tail, just behind the rotating band. To produce impact forces on the fuze as close as possible to those which might be obtained when the fuze is employed in the A.P. rocket head, the cap and windshield were omitted from the projectile on initial rounds tested. When it was found that the projectiles would not penetrate 6" armor plate in effective condition with the cap and windshield removed, they were left in place for subsequent shots. Several rounds were fired through 4" armor plate without the cap and windshield. When recovered (in a sawdust bin behind the target) the noses were chewed off but the projectiles were still effective. High speed motion pictures were taken of the round in flight, with a 35mm Fastax Camera at 3000 frames per second, to ascertain whether it was flighting satisfactorily (Figure 6). The fuzes were returned to the Naval Ordnance Laboratory for examination.

b. Plate Sensitivity

To determine the minimum thickness of plate target required for functioning, fuses were assembled in smoke puff loaded 5" rocket heads Mk 2 and Mk 6 (Figure 12) and fired from the 1050 ft. launcher at 1800 ft./sec. Two 5" HVAR motors were used for propulsion. Targets were placed at the extreme range available, 1250 feet from the initiation point of the rocket motor carrying the fuse, to insure burnout of the motor before target impact. The impact region was covered by a high speed camera to record the delay in functioning after impact.

c. Arming Distance

The time and distance of arming was checked by assembling so-called arming test fixtures in smoke puff loaded 5" rocket heads and firing them from a short launcher (Mk 31) with a 15° quadrant elevation. The test fixture admitted gas to a chamber above the diaphragm in the usual fashion (Figure 11) and then caused the extended diaphragm to drive a firing pin into a detonator. The detonator fired the boosters, which ignited the 380 gram black powder smoke puff charge. Rounds were fired with both 5" HVAR and 5" HPAG motors at temperatures of -30°F, 90°F, and 120°F. Distances along the trajectory were indicated by markers on the ground every 50 feet. Observers located perpendicular to the trajectory checked the functioning distance visually and also by means of high speed 35mm Mitchell cameras photographing the flight. The time from ignition of the rocket to the functioning point was obtained from the film record.

10. RESULTS AND DISCUSSIONS:

A summary and detailed results of the tests are presented in Appendices (A) and (B). Following is a discussion of the results obtained.

a. Heavy Impact Tests - Table I, Appendix (A)

(1) Rounds containing fuze bodies of the design shown in Figure 1, fired from the long launcher at 1800 ft./sec. versus 3" STS plate and recovered for examination, proved that 24 S-T aluminum and 1137 steel are not suitable materials for this fuze body if it is to be subjected to impacts of this magnitude or greater. The aluminum bodies broke and deformed in several places while the threads of the 1137 body failed in shear. Bodies made of 4140 steel remained in good condition after receiving impacts at these conditions and also versus 2" STS at 30° obliquity.

(2) Initial tests of fuses from the 6"25 smoothbore gun at 2800 ft./sec. versus 6" Class B armor plate resulted in break-up of the 6" A.P. projectiles when their caps and windshields were removed before firing. Little could be told about the effect on the fuzes, although it was noted that the only fuzes whose body threads sheared were those made of 1137 steel. Later firings with 4140 steel fuse bodies in similar projectiles tested versus 4" armor plate and in 6" A.P. projectiles retaining their caps and windshields and tested against 6" armor plate, proved that this body would remain in excellent condition with no failure of the threads after these extreme impacts; probably more severe than they will ever be expected to withstand in service.

b. Plate Sensitivity - Table II, Appendix (A)

(1) Extremely poor results were obtained with the fuzes fired for an indication of impact sensitivity. A total of eight fuzes were fired against 1/8" mild steel at 0°, 30°, and 45° obliquity, but only one functioned after the plate impact (at 30° obliquity). Two were reported to have produced a smoke puff when they struck the water, approximately 400 feet beyond the target. One round fired against 3/16" mild steel at 0° obliquity did not function, although a smoke puff was seen on water impact. Only two of seven rounds fired against 1/4" mild steel at 0° obliquity functioned, although three of the five failures did produce a smoke puff on water impact.

c. Arming Distance - Table III, Appendix (A)

(1) Initial tests of the arming fixtures indicated that the fuzes had too short an arming distance, particularly with warm or hot motors. A minimum arming distance of 400 feet from the firing point had been specified as a safety requirement. It is possible that if complete fuzes had been tested that the arming distances obtained might have been extended somewhat due to inertia or friction of the plunger and other moving parts of the arming mechanism.

(2) In the last test of these arming fixtures the orifice in the baffle (Figure 1) was reduced from "009 to an "008 diameter. This further restriction of the gas flow provided greater than the required minimum arming distance on five out of six rounds. Several measurements were made from the film records on the time required for fuse arming from ignition of the rocket motor. Arming time was approximately 0.8 second with the motors at 120°F and 1.5 seconds with the motors at -30°F.

Aircraft Rocket Fuses; XR-51A, XR-8D, and EX-108;
Development of

PART D

CONCLUSIONS

11. It is concluded that:

a. XR-51A fuze bodies made from 4140 steel will withstand any impacts to which they might be subjected in service. They were fired against 3" STS at 1800 ft./sec., 4" Class B at 1950 ft./sec., and 6" Class B armor plate at 2400 and 2800 ft./sec. (all at 0° obliquity) with the fuses recovered in good condition in all cases. Dural fuze bodies broke up and the threads on 1137 steel bodies sheared when subjected to 3" armor plate impacts at 1750 ft./sec.

b. The XR-51A fuze as presently designed and constructed will not meet the requirement of consistent functioning after 1/8" or 1/4" mild steel plate impact. Only one of eight fired at 1800 ft./sec. against 1/8" mild steel functioned (30° obliquity impact) and two of seven fired against 1/4" mild steel at 0° obliquity functioned. Several rounds failing to fire after the steel target impact were reported to have functioned upon water impact 400 feet beyond the target where they may have been subjected to a more severe deceleration.

c. The limited tests conducted indicate that a reduction in the pressure orifice from ∇009 diameter to ∇008 diameter will supply the required minimum arming distance of 400 feet from the launching point, at temperatures ranging from -30°F to 120°F. Although one of the six arming devices tested with an ∇008 diameter orifice functioned just short of the 400 ft. minimum distance (390 feet) it is believed that the friction and inertia in the plunger movement required to complete arming in an assembled fuse would extend this distance sufficiently to meet the requirements.

PART E

RECOMMENDATIONS

12. It is recommended that the plate sensitivity tests be continued after the following steps have been taken:

a. Fire several rounds of XR-51A fuzes in smoke puff loaded heads against 1/2" STS plate to see if the fuze will function consistently if it receives a sufficiently great retardation.

b. If consistent functioning is obtained reduce the friction between the plunger and fuze body by undercutting the former's outer circumference, except for a narrow bourrelet at the forward and after ends of the body. Further, reduce its mass by machining away all unnecessary material -- possibly substituting a material with a lower specific gravity. The lower weight and decreased friction of the plunger should require less retardation to drive the firing pin into the plunger as well as reducing the rotational force involved in arming the fuze.

c. If consistent functioning is not obtained on 1/2" STS targets attempt to discover the cause of the malfunctioning by firing several rounds containing XR-51A fuzes (inert except for primer, delay elements, and lead-ins) into a sand pile for recovery and examination.

Aircraft Rocket Fuses; XR-51A, XR-8D, and EX-108;
Development of

The tests upon which this report is based were conducted by:
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By direction

CONFIDENTIAL

NPG REPORT NO. 971

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

Eighteenth Partial Report

on

Development of Aircraft Rocket Fuzes

- -

Final Report

on

Aircraft Rocket Fuzes;

XR-51A, XR-8D, and EX-108;

Development of

Project No.: NPG-Re2b-11-1-52
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SECURITY INFORMATION

TABLE I

SUMMARY OF RESULTS

XR-51A Heavy Plate Impact Tests - Fired from NPG 1050 ft. Launcher in 5" Rocket Heads Mk 2

Impact Nos.	Date	No. Rds.	Fuze Nos.	Fuze Body Material	Target	Striking Vel. (f/s)	Penetration	Results
39160 39161	7-23-51	2	1, 2	24 S-T Aluminum	3" STS at 0°	1750	Comp.	Arming Failures- Body failed in several places.
39162 39163	7-23-51	2	3, 4	4140 Steel	3" STS at 0°	1750	Comp.	Arming Failures- Fuze bodies in good condition.
39211 39212	8-24-51	2	11, 12	1137 Steel	3" STS at 0°	1750	Comp.	Fuzes functioned- Body weak, sheared through threads.
39254 39255	9-18-51	2	17, 18	4140 Steel	2" STS at 30°	1700	Comp.	Fuze body and threads in excellent condition.

XR-51A Heavy Plate Impact Tests - Fired from 6"25 Smoothbore Gun in 6" AP Projectiles (modified)

Remark: Cap and windshield removed from projectiles before firing.

39213 39214	8-30-51	2	5, 6	Dural	6" at 0°	2800	Comp.	Projectiles broke up- Part of fuze bodies left in base of shell- All internal components of fuze missing.
39215 39220	8-30-51 8-31-51	2	7, 8	4140 Steel	6" at 0°	2800	Comp.	Projectiles broke up- Major portion of fuzes left intact. Diaphragm missing.

TABLE I (Continued)

XR-51A Heavy Plate Impact Tests - Fired from 6"25 Smoothbore Gun in 6" AP Projectiles (modified) (Cont'd)

Remark: Cap and windshield removed from projectiles before firing. (Continued)

Impact Nos.	Date	No. Rds.	Fuze Nos.	Fuze Body Material	Target	Striking Vel. (f/s)	Pene-tration	Results
39221 39222	8-31-51	2	9, 10	1137 Steel	6" at 0°	2750	Comp.	Projectiles broke up- (1) Base plug threads sheared and fuze missing; (2) Fuze threads sheared- Fuze recovered intact.
39496 39497	11-29-51	2	21, 22	4140 Steel	4" at 0°	1950	Comp.	Nose of projectiles broke off- Fuzes intact, good condition.
Remark: Projectiles fired with cap and windshield.								
39485 39486	11-28-51	2	19, 20	4140 Steel	6" at 0°	2400	Comp.	One proj. broke at band score- Second projectile eff-intact- Fuzes intact.
39487 39488	11-28-51	2	1, 2 (EX-108)	--	6" at 0° #2 base slapped	2300	Comp.	Projectiles eff-intact, Fuzes intact. Sent to NOTS for inspection.

TABLE II

SUMMARY OF RESULTS

XR-51A Plate Sensitivity - Fired from 1050 ft. Launcher

Remark: Smoke Puff Loaded in 5" heads Mk 2

Impact Nos.	Date	No. Rds.	Fuze Nos.	Fuze Body Material	Target	Striking Vel. (f/s)	Pene-tration	Results
39286 39287	9-26-51	2	13, 14	--	1/8" MS at 0°	1750	Comp.	Did not function.
39288	9-26-51	1	15	--	1/8" MS at 30°	1720	Comp.	Did not function.
39289	9-26-51	1	16	--	1/4" MS at 0°	1641	Comp.	Smoke puff functioned.
			Remark: Smoke Puff Loaded in 5" heads Mk 6-1					
--	10-17-51	1	23	--	3/16" MS at 0°	1855	Comp.	Did not function on target- All functioned on water.
--	10-17-51	1	24	--	1/8" MS at 45°	1895	Comp.	Did not function on target- All functioned on water.
--	10-17-51	2	25, 26	--	1/4" MS at 0°	1800	Comp.	Did not function on target- All functioned on water.
39481	11-27-51	1	28	--	1/8" MS at 0°	1869	Comp.	Did not function on target.

TABLE II (Continued)

XR-51A Plate Sensitivity - Fired from 1050 ft. Launcher (Continued)

Remark: Smoke Puff Loaded in 5" heads Mk 6-1 (Continued)

Impact Nos.	Date	No. Rds.	Fuze Nos.	Fuze Body Material	Target	Striking Vel. (f/s)	Pene-tration	Results
39482 39483	11-27-51	2	29, 30	--	1/4" MS at 0°	1700, 1900	Comp.	Did not function on target- One functioned on water impact.
--	2-15-52	2	31, 35	--	1/4" MS at 0°	1877, 1850	Comp.	One functioned with 10 ft. delay- One a complete dud.
--	2-15-52	1	32	--	1/8" MS at 0°	1858	Comp.	Did not function.
--	2-15-52	2	33, 34	--	1/8" MS at 30°	N.G. 1926	Comp.	One functioned with 8 ft. delay - Second a dud on target but functioned on water.

TABLE LII

SUMMARY OF RESULTS

XR-51A Arming Distance Test - Fired from Short Launcher

Date	No. Rds.	Fuze Nos.	Motor Temp.	Remarks	Smokepuff - Ft. from Breech of Launcher	Time-Ignition to Functioning (Secs)
10-16-51	3	4, 6, 5	+120°F	Smokepuff in 5" head Mk 6 and 5" motor Mk 2	300, 365, 265	---
10-16-51	3	1, 2, 3	-30°F	Smokepuff in 5" head Mk 6 and 5" motor Mk 2	310, 375, 400	---
10-16-51	3	7, 8, 9	-30°F	Smokepuff in 5" head EX-9 and 5" HPAG motor	420, 400, 370	---
10-16-51	3	10, 11, 12	120°F, 90°F 90°F	Smokepuff in 5" head EX-9 and 5" HPAG motor	285, 260, 340	---
2-1-52	3		-30°F	Smokepuff in 5" head Mk 2 and 5" motor Mk 2	525, 575, 830	1.44, ---, ---
2-1-52	3		+120°F	Smokepuff in 5" head Mk 2 and 5" motor Mk 2. Orifice changed from .009 to .008	460, 570, *350	0.84, 0.88, 0.71

*Film indicated this distance was 390 ft.

NAVORD FORM 1883 (Nov ...)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39160

IMPACT DATE 23 July 1951

NPG TEST NO Code 10903

OBJECT HEAVY IMPACT TEST OF XR-51A ROCKET FUZES FIRED FROM 1050' ROCKET LAUNCHER

Reference: NPG ~~ltr~~ Report No. 971 dated

Reference: ~~BuOrd~~ BuOrd ltr. NP1 ADL(XI-1(850)DF:GDR01347 dated 28 Jul 1951

Task Assignment No. NPG-Re2b-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 3".0 Class CL. B.
Maker MIDVALE
No. 12315 Group PRAT. TEST
Dimensions 120" x 240"

OBLIQUITY 0°

PENETRATION COMPLETE
Thickness at Impact 3".13
No. of impact on plate 34
Dist. from nearest impact 8"
Dist. from near edges L-51" and R-53"
Impact area 5" x 6"
Spall: Front 0 Back 0
Dish 1/4" Spur 2"
Cracks 0
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge 0
Through opening 5" x 5"

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 2 No 8770 Wt. 46.32#
Maker CSCA
Lot No. 38
Filler: Type VERM. Wt. -
Fuzes XR-51A #1 - DURAL BODY
Boosters
Wt. of head (as fired) 46.32#

MOTOR: Cal. 5" Mk. 2 Mod 9
Motor temp. 80° Wt. 87.75#

COMPLETE ROUND: Mark Mod
Wt. (as fired) 134.07#
Wt. (burned)

OTHER INFORMATION MOTORS (2)
GRAIN-MK. 13-C
AIN-KM)DA-137-H-45
LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight Velocity, f/s: ~~Striking~~ Mean 1747 Residual
Fuze functioning
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head was in (EFFECTIVE) ~~(INEFFECTIVE)~~ INTACT condition

REMARKS: Fuze arming failure - Body of fuze failed in several places

Photo No.

Signed F. W. [signature]
F. W. [illegible]
ORD. ENG. [illegible]

Impact Record #1

Security Information

5

NAVORD FORM 1883 (Nov 3-45)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 89161

IMPACT DATE 23 JULY 1951

NPG TEST NO. CODE 10903

OBJECT HEAVY IMPACT TEST OF XR-51A ROCKET FUZES FIRED FROM 1050' ROCKET LAUNCHER

Reference: NPG ~~ltr.~~ Report No. 971 dated
Reference: ~~BuOrd~~ NOL ltr. NP/NOL/Xi-1(950) DF: GDB 01347 dated 28 July 1951
Task Assignment No. NPG-Re2d-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 3."0 Class CL. B
Maker MIDVALE
No. 12315 Group PROJ. TEST
Dimensions 120" x 240"

OBLIQUITY 0°

PENETRATION COMPLETE
Thickness at impact 3."13
No. of impact on plate 25
Dist. from nearest impact 24"
Dist. from near edges J-66" and K-35"
Impact area 5" X 6"
Spall: Front 0 Back 0
Dish 1/4" Spur 3"
Cracks 0
Punching (thrown) (started)
Back Button (thrown) ~~(started)~~
Bulge 0
Through opening 5" X 5"

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 2 No 5732 Wt. 45.48#
Maker CSCA
Lot No. 38
Filler: Type VERM. Wt. -
Fuzes XR-51A #2 - DURAL BODY
Boosters
Wt. of head (as fired) 45.48#

MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 80° WT. 88.95#

COMPLETE ROUND: Mark Mod
Wt. (as fired) 135.98#
Wt. (burned)

OTHER INFORMATION MOTORS (2)
GRAIN, MK 11-0
ALN: RMDA-137-H.45
LAUNCHER 1050' ROCKET LAUNCHER.

ROCKET PERFORMANCE

Flight ______ Velocity, f/s: ~~Striking~~ MEAN 1755 Residual
Fuze functioning
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head was in (EFFECTIVE) ~~(INEFFECTIVE)~~ INTACT condition.

REMARKS: Fuze Arming Failure - Fuze body failed in several places

Photo No.

Signed F.W. Rasdorf
F.W. RASDORF, Lt.
ORD. PRF. ES-12

Impact Record #2

CONFIDENTIAL
Security Information

NAV... FORM 1... (New ...)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39162
IMPACT DATE 23 July 1951
NPG TEST NO Code 10903

OBJECT HEAVY IMPACT TEST OF XR-51A ROCKET FUZE FIRED FROM 1050' ROCKET LAUNCHER.

Reference: NPG ~~ltr.~~ Project No. 971 dated
Reference: ~~BuOrd~~ NOL ltr. NP/NOL(XI-1(950)DE:GDB c1347 dated 28 July 1951
Task Assignment No. NPG-Re2c-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 3.0 Class CL. C
Maker MIDVALE
No. 12315 Group PROJ. TEST
Dimensions 120" X 240"

OBLIQUITY 0°

PENETRATION Complete
Thickness at impact 3.13
No. of impact on plate 36
Dist. from nearest impact 16"
Dist. from near edges T-60 and R-50"
Impact area 6"X7"
Spall: Front 0 Back 0
Dish 1/4" Spur 2"
Cracks 0
Punching (thrown) (started)
Back Button (thrown) ~~(started)~~
Bulge 0
Through opening 5"X 5 1/4"

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 3 No 9914 Wt. 47.03#
Maker USAF
Lot No. 33
Filler: Type VERM. Wt. -
Fuzes XR-51A #3 - 4140 STEEL BODY
Boosters
Wt. of head (as fired) 47.03#

MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 80° WT. 89.30#

COMPLETE ROUND: Mark Mod
Wt. (as fired) 126.33#
Wt. (burned)

OTHER INFORMATION MOTORS (2)
GRAIN: MK 18-0
FIN: EMDA-137-H-45
LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight Velocity, f/s: ~~Striking~~ Mean 1740 Residual
Fuze functioning
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head was in (EFFECTIVE) ~~(INEFFECTIVE)~~ INTACT condition

REMARKS: Fuze Arming Failure - body in good condition

Photo No.

Signed F W Kasdorf
F.W. ... Lt
... 63-12

Impact ... #3

CONFIDENTIAL
Security Information

NAVORD FORM 1883 (New 3/48)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39163

IMPACT DATE 23 JULY 1951

NPG TEST NO. CODE 10903

OBJECT HEAVY IMPACT TEST OF XR-51A ROCKET FUZES FIRED FROM 1050' ROCKET LAUNCHER

Reference: NPG ~~ltr.~~ Report 921 dated

Reference: ~~NOL~~ ltr. NP/No. [illegible] (X50) DF:GDB 01347 dated 28 July 1951

Task Assignment No. NPG-Re 22-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 3.0 Class C.I. B

Maker MIDVALE

No. 12315 Group PLT. TEST

Dimensions 120" X 240"

OBLIQUITY 0°

PENETRATION COMPLETE

Thickness at Impact 3.13

No. of impact on plate 21

Dist. from nearest impact 9"

Dist. from near edges T-60" and R-50"

Impact area 6" X 7"

Spall: Front 0 Back 0

Dish 1/4" Spur 1"

Cracks 0

Punching (thrown) (started)

Back Button (thrown) (started)

Bulge 0

Through Opening 5" X 5 1/4"

ROCKET

HEAD: Cal. 5" Type SEMI-AP

Mark 2 Mod 2 No. 8936 Wt. 47.27#

Maker OSCA

Lot No. 38

Filler: Type VERM. Wt. —

Fuzes XR-51A #4 - 4140 Steel Body

Boosters

Wt. of head (as fired) 47.27#

MOTOR: Cal. 5" Mk. 2 Mod 3

Motor temp. 90° WT. 87.95#

COMPLETE ROUND: Mark Mod

Wt. (as fired) 135.22#

Wt. (burned)

OTHER INFORMATION MOTORS (2)
GKAIN: MK 14-0
ALN: RMDA-137-A-45

LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight Velocity, f/s: MEAN Striking 1775 Residual

Fuze functioning

Explosive action (High Order) (Low Order) (None)

Distance of burst behind plate

Condition of recovered round BASE BROKE OFF FUZE KNOCKED OUT

Head was in (EFFECTIVE) (INEFFECTIVE) condition.

REMARKS: I.S. FOUND KEYHOLED IMPACT 39162 BASE OF HEAD BROKE OFF BUT FUZE REMAINED INTACT. - FUZE ARMING FAILURE - FUZE DEFORMED

Photo No.

Signed F.W. Kasdorf
F.W. KASDORF, Lt
ORD. E.L.C. GS-12

Impact Record #4

CONFIDENTIAL
Security Information

NAVORD FORM 1583 (Nev _ 3)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39211

IMPACT DATE 8-24-51

NPG TEST NO Code 10747

OBJECT Recovery Test of Two (2) XR-51A Partially Loaded Fuzes Vs 3" C.B Armor Plate

Reference: NPG ~~ltr.~~ Request Dwg. 921 dated

Reference: ~~NOL~~ ltr. NPG/RU-1/250/DF: GDB 01347 dated 28 July 1951

Task Assignment No. NPG-Re2E-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 3" Class C.B
Maker Midvale
No. 12315 Group Proof Test
Dimensions 120" x 240"

OBLIQUITY 0°

PENETRATION Complete
Thickness at Impact 3.06
No. of impact on plate 36
Dist. from nearest impact —
Dist. from near edges 5.50" and 1.94"
Impact area —
Spall: Front — Back —
Dish — Spur —
Cracks —
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge —
Through opening 5"x 5"

ROCKET

HEAD: Cal. 5" Type
Mark 2 Mod 2 No. ~~2891~~ Wt. 42.71#
Maker C.S.C.F.
Lot No. 3B
Filler: Type Verm. Wt. —
Fuzes XR-51A — NOL
No 11 - 1137 Steel Body
Boosters —
Wt. of head (as fired) 42.71#

MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 100° Wt. 58.55#

COMPLETE ROUND: Mark Mod
Wt. (as fired)
Wt. (burned)

OTHER INFORMATION Motors: (2)
ALN: RMDA-137.H.45

LAUNCHER 105 Rocket Launcher

ROCKET PERFORMANCE

Flight Velocity, f/s: ~~Striking~~ Mean 1597 Residual
Fuze functioning
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head Was In (EFFECTIVE) (~~INEFFECTIVE~~ intact) condition.

REMARKS: Fuze functioned - Inserter cup threads on body sheared at pitch

Photo No. —

Signed R. T. Crowell
Ord Eng 85-9

Impact No. 11 5

CONFIDENTIAL
Security Information

NAVORD FORM 1583 (Nev ..)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39212

IMPACT DATE 8-24-51

NPG TEST NO. Code 10747

OBJECT RECOVERY TEST OF TWO (2) XR-51A PARTIALLY LOADED FUZES (S) 3" CL. B HOWCO BASE

Reference: NPG ~~ltr.~~ Ordnance Pamphlet No. 971 dated

Reference: ~~NOL~~ ltr. NP/NOL/YI-(850)DF:GDB 01347 dated 28 July 1951

Task Assignment No. NPG-Re 28-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 3" Class "B"
Maker MIDVALE
No. 12315 Group Proj. Test
Dimensions 120" X 240"

OBLIQUITY 0°

PENETRATION COMPLETE
Thickness at Impact 3".06
No. of impact on plate 37
Dist. from nearest impact —
Dist. from near edges T-36 and L-93"
Impact area —
Spall: Front — Back —
Dish — Spur —
Cracks —
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge —
Through opening 5"X5"

ROCKET

HEAD: Cal. 5" Type
Mark 2 Mod 2 No. 5809 Wt. 47.23#
Maker C.S.C.A. BASE
Lot No. 38
Filler: Type VERM Wt. —
Fuze XR-51A — NOL
No. 12 - 1137 STEEL Body
Boosters
Wt. of head (as fired) 47.23#

MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 100° Wt. 90.00#

COMPLETE ROUND: Mark Mod
Wt. (as fired)
Wt. (burned)

OTHER INFORMATION MOTORS: (2)
ALN: RMOA-137-H-45

LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight Velocity, f/s: Mean ~~Striking~~ 1789 Residual
Fuze functioning
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head was in (EFFECTIVE) (~~INEFFECTIVE~~) Intact condition

REMARKS: Fuze functioned - fuze body threads sheared, adapter threads sheared

Photo No.

Signed R. T. CRAWFORD
Gun Eng. GS-7

Impact Record #6

CONFIDENTIAL
Security Information

File No.

Butt Firing

U. S. Naval Proving Ground

Dahlgren, Va. 8-30-51 191

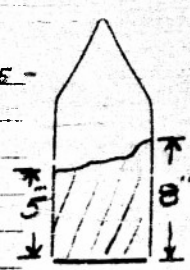
[illegible] 39213
[illegible] 30 Aug. 1951
[illegible] 7

OBJECT 6" SMOOTHBORE GUN TEST OF XR-51A INERT ROCKET FUZES VS. 6" CLASS B ARMOR AT 0° OBL.

REFERENCE ~~N.P.G.~~ NOL LETTER NP/NOL/X1-1(850) DF: GDB 01347 DATED 28 July 1951

NPG Report No. 991

PLATE		PROJECTILE	
Gauge	6".0	Caliber	6"
Class	"B"	Maker	MIDVALE
Maker	CARNEGIE	Type	A.P.
No.	TT 277 Group PROJ. TEST	Lot No.	139 Year of Specification 1943
Contract	NORD-5282	Mark	35 Mod. 5 No. NNT186
Date received	30 AUG. 1944	Date received	-
Dimensions	120" X 300"	~~Capped or~~ uncapped	
No. of impact on plate	3	~~Weight (capped)~~	
Thickness at impact	6".06	Weight (uncapped)	98.43#
OBLIQUITY	0°	Length (uncapped)	15.17
Impact dimensions	9" X 9"	BASE Fuze	XR-51A INERT #5 DURAL
PENETRATION	COMPLETE	Filler	VERMICULITE
Flaking front	0	Flight by screen	
Flaking back	0	Condition after firing:-	
Dist. from top, ~~bottom~~	76"	~~EFFECTIVE or~~ INEFFECTIVE	
Dist. from ~~right,~~ left	124"	FUZE BODY LEFT IN PLACE -	
Dist. from nearest impact	39"	ALL INTERNAL COMPONENTS	
Dish	0	MISSING - BODY FAILURE	
Spur	4"		
Cracks - Bulge	0		
Button (Thrown) ~~(Started)~~			
Through Opening	8" X 8"		



BALLISTIC DATA

NOTE: All limits are for this plate and this obliquity only.	-1- Desired	-2- Oscillograph	-3- Chronograph	-4- Limit, estimated for the thickness of impact	-5- Actual adjusted to nominal gauge	-6- Limit, for nominal gauge, based on the impact only. (Adjusted from column 4)	-7- Limit, for nominal gauge, established from column 6 and previous impacts.
		MEAN					
Striking velocity (f.s.)		2878					

REMARKS

Limit shots only

c/d

Fte/d. (-)

N.P.G. Photo. No. NP9-46056 THRU 46060

Impact Record #7

Acceptance or Rejection recommended

F. H. [illegible]
F. H. [illegible]
[illegible] U. S. Navy

CONFIDENTIAL
Security Information

File No.

39214
30 AUG. 1951
7

Butt Firing

U.S. Naval Proving Ground

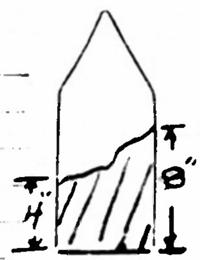
Dahlgren, Va. 8-30-51 194

OBJECT 6" SMOOTHBORE GUN TEST OF XR-51A INERT ROCKET FUZES VS. 6" CLASS B ARMOR AT 0° OBL.

REFERENCE ~~NPG~~ NOL LETTER NP/NOL/X1-1(850) DF:GVB c1347 DATED 28 July 1951

NPG Report No 991

PLATE		PROJECTILE	
Gauge	6.0	Caliber	6"
Class	"B"	Maker	MIDVALE
Maker	CARNEGIE	Type	A.P.
No.	TT277 Group PROJ. TEST	Lot No.	139 Year of Specification 1943
Contract	NORD-5272	Mark	35 Mod. 5 No. MMO 72
Date received	30 AUG. 1944	Date received	—
Dimensions	120" X 300"	~~Capped or~~ uncapped	
No. of impact on plate	4	~~Weight (capped)~~	
Thickness at impact	6.06	Weight (uncapped)	100.20#
OBLIQUITY	0°	Length (uncapped)	15.17
Impact dimensions	7"X9"	Base Fuze	XR-51A INERT #6 DURAL
PENETRATION	COMPLETE	Filler	VERMICULITE
Flaking front	0	Flight by screen	
Flaking back	0	Condition after firing:-	
Dist. from top, ~~bottom~~	59"	~~EFFECTIVE~~ or INEFFECTIVE	
Dist. from ~~right~~, left	124"	FUZE BODY LEFT IN	
Dist. from nearest impact	17"	PLACE - ALL INTERNAL	
Dish	0	COMPONENTS MISSING	
Spur	3"	- BODY FAILURE	
Cracks - Bulge	0		
Button (Thrown ~~Started~~)	—		
Through Opening	8"X8"		



BALLISTIC DATA

NOTE:	1	2	3	4	5	6	7
All limits are for this plate and this obliquity only.		MEAN					
Striking velocity f.s.		2720					

REMARKS

Limit shots only

Impact Record #8

Acceptance or Rejection recommended

F.W. Kasdorf

F.W. KASDORF, Jr.

ORD. ENG. ES-12

NPG-46056 THRU 46060

GUN: 6"/25 MK II ... #1198

CONFIDENTIAL
Security Information

Butt Firing

U.S. Naval Proving Ground
Dahlgren, Va. 8-30-51 19[illegible]

Report No. 39215
Report Date 30 AUG. 1951
Page No. 1

OBJECT 6" SMOOTHBORE GUN TEST OF XR-51A INERT ROCKET FUZES VS. 6" CLASS "B" ARMOR AT 0° OBL.

REFERENCE ~~BuOrd~~ NOL LETTER NP/NOL/X1-1(850) OF: GDB 01447 DATED 28 July 1951

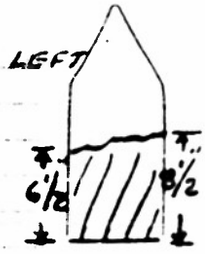
OFS Report No 971

PLATE

Gauge 6"0
Class "B"
Maker CARNEGIE
No. TT 277 Group PROJ. TEST
Contract NORD-5282
Date received 30 AUG. 1944
Dimensions 120" X 300"
No. of impact on plate 5
Thickness at impact 6".06
OBLIQUITY 0°
Impact dimensions 9" X 10"
PENETRATION COMPLETE
Flaking front 0
Flaking back 0
Dist. from top, ~~bottom~~ 45"
Dist. from ~~right~~, left 125"
Dist. from nearest impact 14"
Dish 0
Spur 3"
Cracks - Bulge 0
Button (Thrown) ~~(Started)~~
Through Opening 9" X 8½"

PROJECTILE

Caliber 6"
Maker MIDVALE
Type A. P.
Lot No. 139 Year of Specification 1943
Mark 35 Mod. 5 No. LV 111
Date received
~~Capped or~~ uncapped
~~Weight (capped)~~
Weight (uncapped) 101.27#
Length (uncapped) 15.17
Fuze XR-51A INERT #7-4140 STEEL
Filler VERMICULITE
Flight by screen
Condition after firing:-
~~EFFECTIVE or~~ INEFFECTIVE
MAJOR PORTION OF FUZE LEFT INTACT - BALLOWS GONE - BASE SQEEZED



BALLISTIC DATA

Note: All limits are for this plate and this obliquity only.	1 Desired	2 Obtained MEAN	3 Curves equiv.	4 [illegible]	5 [illegible]	6 [illegible]	7 [illegible]
Striking velocity of [illegible]		2821					

REMARKS

Impact No. 9

F. W. Sanders
F. W. SANDERS, Lt.
ORDFD, 6-5-12 [illegible]

NP 9-46036 [illegible]

CONFIDENTIAL
Security Information

File No.

Butt Firing

U. S. Naval Proving Ground

Dahlgren, Va. 8-31-51 194

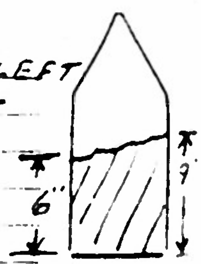
Firing No. 39220
Firing Date 8-31-51
Butt No. 7

OBJECT 6" SMOOTHBORE GUNTEST OF XR-51A INERT ROCKET FUZES VS. 6" CL B. ARMOR AT 0° OBL.

REFERENCE ~~BUORD~~ NOL LETTER NP/NOL/X1-K850) OF ADB 01349 DATED 28 July 1951

Firing Report No. 911

PLATE		PROJECTILE	
Gauge	6.0	Caliber	6"
Class	"B"	Maker	MIDVALE
Maker	CARNEGIE	Type	A.P.
No.	TT277 Group PROJ. TEST	Lot No.	139 Year of Specification 1943
Contract	NORD-5282	Mark	35 Mod. 5 No. NND 30
Date received	30 AUG. 1944	Date received	-
Dimensions	120" X 300"	~~Capped or~~ uncapped	
No. of impact on plate	6	~~Weight (capped)~~	
Thickness at impact	6.06	Weight (uncapped)	101.97 #
OBLIQUITY	0°	Length (uncapped)	15.17
Impact dimensions	9" X 9"	Fuze	XR-51B INERT #8-4140 STEEL
PENETRATION	COMPLETE	Filler	VERMICULITE
Flaking front	0	Flight by screen	
Flaking back	0	Condition after firing:-	
Dist. from top, ~~bottom~~	62"	~~EFFECTIVE or~~ INEFFECTIVE	
Dist. from ~~right~~, left	142"	MAJOR PORTION OF FUZE LEFT INTACT - BELLOWS GONE - BASE OK.	
Dist. from nearest impact	18"		
Dish	0		
Spur	3"		
Cracks - Bulge	0		
Button (Thrown) ~~(Started)~~			
Through Opening	8" X 8"		



BALLISTIC DATA

NOTE:	1	2	3	4	5	6	7
All limits are for this plate and this obliquity only.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Limit, for nominal gauge, established from column 6 and previous impacts
		MEAN					
[illegible]		2928					

REMARKS

[illegible]

Impact area #10 F. W. Kessler
F. W. KESSLER Jr. [illegible]
[illegible]

CONFIDENTIAL
Security Information

File No. 29221

Butt Firing

U.S. Naval Proving Ground

Dahlgren, Va. 8-31-51 19[illegible]

8-31-51

7

Object: 6" SMOOTHBORE GUN TEST OF XR-51A INERT PROJECT FUZES IN 6" CL. B. ARMOR AT [illegible] OBL.

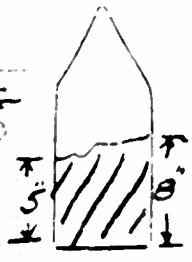
Ballistics: NOL ~~NOTE~~ LETTER NP/Sec/XR-[illegible] OF [illegible] 1947 DATED 28 July 1947

[illegible] PLATE

Gauge	6.0
Class	"B"
Maker	CARNEGIE
No.	TT 277 Group PROJ. TEST
Contract	NORD-5282
Date received	30 AUG. 1944
Dimensions	120" X 300"
No. of impact on plate	1
Thickness at impact	6.13
OBLIQUITY	0°
Impact dimensions	9" X 9"
PENETRATION	COMPLETE
Flaking front	0
Flaking back	0
Dist. from top, ~~bottom~~	77"
Dist. from ~~right~~, left	142"
Dist. from nearest impact	15"
Dish	0
Spur	2"
Cracks - Edge	0
Button (Thrown) ~~(Started)~~	
Through Opening	1" X 2"

PROJECTILE

Caliber	6"
Maker	MIDVALE
Type	A.P.
Lot No.	139 Year of Specification 1943
Mark	35 Mod. 5 No. MI-2314
Date received	-
~~Capped or~~ uncapped	
~~Weight (capped)~~	
Weight (uncapped)	101.72#
Length (uncapped)	15.17
Fuze	XR-51A INERT #9-1137 STEEL
Filler	VERMICULITE
Flight by screen	
Condition after firing:-	
~~EFFECTIVE~~ or INEFFECTIVE	
BASE PLUG THREADS SHEARED - FUZE MISSING - FUZE BODY THREADS SHEARED	



BALLISTIC DATA

Series					
		WEAK			
		2150			

REMARKS

Impact Recd #11 F.W. Sander

F.W. [illegible]

CONFIDENTIAL
Security Information

File No.

Butt Firing

U.S. Naval Proving Ground

Dahlgren, Va. 8.31-51 19[illegible]

Impact No. 39222

Impact Date 8.31-51

Butt No. 9

OBJECT 6" SMOOTH BORE GUN TEST OF XR-51A INERT ROCKET FUZES VS. 6" CL. B ARMOR AT 0° OBL.

REFERENCE NOL LETTER NP/NOL/X1-1(850) DF:GDB C1347 DATED 28 July 1951

NPS Rept 3D9701

PLATE		PROJECTILE	
Gauge	6"0	Caliber	6"
Class	"B"	Maker	MIDVALE
Maker	CARNEGIE	Type	A.P.
No.	TT277 Group PROJ. TEST	Lot No.	139 Year of Specification 1943
Contract	NORD-5282	Mark	35 Mod. 5 No. NND-38
Date received	30 AUG. 1944	Date received	—
Dimensions	120" X 300"	~~Capped or~~ uncapped	
No. of impact on plate	8	~~Weight (capped)~~	
Thickness at impact	6.00	Weight (uncapped)	101.46#
OBLIQUITY	0°	Length (uncapped)	15.17
Impact dimensions	9" X 9"	Fuze	XR-51A INERT #10-1137 STEEL
PENETRATION	COMPLETE	Filler	VERMICULITE
Flaking front	0	Flight by screen	
Flaking back	0	Condition after firing:-	
Dist. from top, ~~bottom~~	47"	~~EFFECTIVE or~~ INEFFECTIVE	
Dist. from ~~right~~, left	143"	BASE PLUG AND FUZE THREADS SHEARED- FUZE RECOVERED SEPARATELY IN GOOD CONDITION	
Dist. from nearest impact	15"		
Dish	0		
Spur	3"		
Cracks - Bulge	0		
Button (Thrown) ~~(Started)~~			
Through Opening	7½" X 8"		

BALLISTIC DATA

NOTE: All limits are for this plate and this obliquity only.	-1- Desired	-2- Oscillograph MEAN	-3- Chronograph	-4- Limit, estimated for this thickness & impact	-5- Actual adjusted to general range	-6- Limit, for nominal striker, based on this impact only. (Adjusted from column 4)	-7- Limit, for nominal range established from column 6 and previous impacts.
Striking velocity (f.s.)		2753					

REMARKS

Limit shots only

e/d

F(e/d, 0)

N.P.G. Photo No. NP1-46056 THRU 46060

Acceptance or Rejection recommended

F.W. Kasdorf

Impact Board #12 F.W. KASDORF, Ch.

ORD. ENG., USN ~~U.S. Navy~~

GUN: 6"/26 MK 16 MOD 0 #1198

CONFIDENTIAL
Security Information

NAVEXOS P-[illegible] (Rev. [illegible])

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 19254

IMPACT DATE 9-18-51

NPG TEST NO. 11382

OBJECT IMPACT TEST OF XR-5IA ROCKET FUZES (4140 STEEL BODIES) HAVING LIVE PRIMER, DELAY & DETONATOR

Reference: ~~BuOrd~~ NOL ltr. NP[NOL]X1-1(850) OF:GDG 01347 dated 28 July 1951

Reference: ~~BuOrd~~ ltr. [illegible] dated

Task Assignment No. NPG-Re2b-11-1-52 dated 4 August 1951

PLATE TARGET

Caps 2.0 Class STS
Maker -
No. - Group -
Dimensions 96" x 252"

OBLIQUITY 30°

PENETRATION COMPLETE
Thickness at Impact 1.97
No. of impact on plate
Dist. from nearest impact 26"
Dist. from near edges 7.61" and 2.54"
Impact area 6" x 7"
Spall: Front 0 Back 0
Dish 1/4" Spur 3
Cracks 0
Punching (thrown) (started)
Back Button (thrown) ~~started~~
Bulge 6
Through opening 5" x 5 1/2"

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 2 No. - Wt. 47.61
Maker GSCA
Lot No. 38
Filler: Type VERM. Wt. -
Fuzes XR-5IA FROM NOL #17 - 4140 STEEL BODY
Boosters
Wt. of head (as fired) 47.61#

MOTOR: Cal. 5" Mk. 10 Mod 4
Motor temp. 120° wt 88.00#

COMPLETE ROUND: Mark Mod
Wt. (as fired) 135.61#
Wt. (burned)

OTHER INFORMATION MOTORS (2)
ALN: R7 DA-312-H-50
GRAIN: MK 18-0
LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight Velocity, f/s: ~~Striking~~ MEAN 1675 Residual
Fuze functioning
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head was In (EFFECTIVE) (INEFFECTIVE)

REMARKS:

Photo No. Signed F. W. PFISTERER, Jr.
[illegible]

CONFIDENTIAL
Security Information

NAVPRO FORM 1583 (New 3-47)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39255

IMPACT DATE 9-18-51

NPG TEST NO. 11382

OBJECT Impact test of XR-51A Rocket Fuzes (4140 steel bodies) having like primer, delay + detonator

Reference: ~~NPG~~ NOL ltr. NP/NOL/X1-1(850) DF:GDB 01347 dated 28 July 1951

Reference: ~~BuOrd ltr.~~ NPG Request NW 901 dated

Task Assignment No. NPG-Re2b-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 2.0 Class STS
Maker -
No. - Group -
Dimensions 96" X 252"

OBLIQUITY 30°

PENETRATION Complete
Thickness at impact 1.97
No. of impact on plate -
Dist. from nearest impact 19"
Dist. from near edges 7-39" and 1-51"
Impact area 6"X7"
Spall: Front 0 Back 0
Dish 1/4" Spur 2"
Cracks 0
Punching (thrown) (started)
Back Button (thrown) ~~(started)~~
Bulge 0
Through opening 5"X 5-3/4"

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 2 No. - Wt. 47.70#
Maker CSCA
Lot No. 38
Filler: Type VERM. Wt. -
Fuzes XR-51A from NOL #18 - 4140 steel body
Boosters -
Wt. of head (as fired) 47.70#

MOTOR: Cal. 5" Mk. 10 Mod 4
Motor temp. 120° Wt. 89.30#

COMPLETE ROUND: Mark Mod
Wt. (as fired) 137.00#
Wt. (burned)

OTHER INFORMATION Motors (2) MK18-0 grain
ALN: [illegible] -317 H-50
" " -315 H-50

LAUNCHER 1050' Rocket Launcher

ROCKET PERFORMANCE

Flight Velocity, f/s: ~~Striking~~ Mean 1723 Residual
Fuze functioning
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head was in (EFFECTIVE) (INEFFECTIVE) condition

REMARKS:

Photo No.

Signed E. W. [illegible]

[illegible]

CONFIDENTIAL
Security Information

NAVORD FORM 1883 (Nov 1944)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39286

IMPACT DATE 9-26-51

NPG TEST NO. Code 11369

OBJECT SENSITIVITY TEST OF XR-51A FUZES IN 5" ROCKET HEADS MK 2 SMOKE PUFF LOADED

Reference: ~~BuNo~~ No. ltr. NP/NOL/XI-1(850)DF:GDB0347 dated 28 July 1951

Reference: ~~BuOrd ltr.~~ NP Report No. 971 dated

Task Assignment No. NPG-Re2b-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 1/8" Class M.S.

Maker

No. Group

Dimensions

OBLIQUITY 0°

PENETRATION

Thickness at Impact

No. of impact on plate

Dist. from nearest impact

Dist. from near edge and

Impact area

Spall: Front Back

Dish Spur

Cracks

Punching (thrown) (started)

Back Button (thrown) (started)

Bulge

Through opening

NO MEASUREMENTS

ROCKET

HEAD: Cal. 5" Type SEMI-AP

Mark 2 Mod 2 No 5076 Wt. 45.25#

Maker CS Col.

Lot No. 38

Filler: Type B. PDR. Wt. 1.0#

Fuzes XR-51A FROM NOL #13

Smoke Puff Loaded

Boosters —

Wt. of head (as fired) 46.25#

MOTOR: Cal. 5" Mk. 2 Mod 3

Motor temp. 120° WT. 88.05

COMPLETE ROUND: Mark Mod

Wt. (as fired) 134.30#

Wt. (burned)

OTHER INFORMATION MOTORS (2)

GRAIN - MK 12-0

IGN: RMQA-2 26-H-45

LAUNCHER 1650' R. LAUNCHER

ROCKET PERFORMANCE

Flight Velocity, f/s: ~~Striking~~ MEAN 1259 Residual

Fuze functioning

Explosive action (High Order) (Low Order) (None)

Distance of burst behind plate

Condition of recovered round

Head was in (EFFECTIVE) (INEFFECTIVE) condition

REMARKS: Fuzes tested in Fin

Photo No.

Signed F. W. RASDORF, CL
CED. ENG. 6-12

Impact Record #15

CONFIDENTIAL
Security Information

NAVORD FORM ... (Rev ...)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39287

IMPACT DATE 9-26-51

NPG TEST NO. Fde 11369

OBJECT Sensitivity test of XR 51A fuzes in 5" Rocket Head Mk 2 Smoke Puff Loaded

Reference: ~~NPG~~ NOL ltr. NP/NOL/X1-1(850) DF:ODB 01347 dated 28 July 1951

Reference: ~~Buord ltr.~~ [illegible] dated

Task Assignment No. NPG-Re26-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 1/4" Class M.S.
Maker
No. Group
Dimensions

OBLIQUITY 0°

NO MEASUREMENTS

PENETRATION
Thickness at impact
No. of impact on plate
Dist. from nearest impact
Dist. from near edges and
Impact area
Spall: Front Back
Dish Spur
Cracks
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge
Through opening

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 2 No 5075 Wt. 45.00#
Maker A.S.Co.
Lot No. 38
Filler: Type E. Pdr. Wt. 0.75#
Fuzes XR-51A FROM NOL #14
SMOKE PUFF LOADED
Boosters —
Wt. of head (as fired) 45.75#

MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 120° WT. 87.80

COMPLETE ROUND: Mark Mod
Wt. (as fired) 133.55#
Wt. (burned)

OTHER INFORMATION MOTORS (2)
GRAIN - MK 13-0
ALL: RDMCB-226-H-45
LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight Velocity, f/s: ~~Striking~~ Mean — Residual
Fuze functioning
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head was in (EFFECTIVE) (INEFFECTIVE) condition

REMARKS:

Photo N Signed [illegible]
[illegible] ES-12

Impact Record #16

CONFIDENTIAL
Security Information

NAVEXOS P-RM 15-3 (Rev

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 3928

IMPACT DATE 9-26-51

NPG TEST NO. CODE 11369

OBJECT SENSITIVITY TEST OF XR-51A FUZES IN 5" ROCKET HEADS MK 2 SMOKE PUFF LOADED

Reference: ~~BuOrd~~ NOL ltr. NP/A04/X1-1(850)DE:GDR 01347 dated 28 July 1951
Reference: ~~BuOrd ltr.~~ DTE Project No 7111 dated
Task Assignment No. NPG-Re2b-1-1-52 dated 4 August 1951

PLATE TARGET

Gage 1/8" Class M.S.
Maker
No. Group
Dimensions

OBLIQUITY 30°

PENETRATION
Thickness at Impact NO MEASUREMENTS
No. of impact on plate
Dist. from nearest impact
Dist. from near edges, and
Impact area
Spall: Front Back
Dish Spur
Cracks
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge
Through opening

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 2 No 5114 Wt. 47.25#
Maker G.S. Co.
Lot No. 38
Filler: Type B.Pdr. Wt. 1.0#
Fuzes XR-51A FROM NOL #15
SMOKE PUFF LOADED
Boosters —
Wt. of head (as fired) 48.25#

MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 120° AT. 89.80

COMPLETE ROUND: Mark Mod
Wt. (as fired) 138.05#
Wt. (burned)

OTHER INFORMATION MOTOR 2(2)
GRAIN - MK 18-0
FUZE: RMOR-226-H-45
LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight Velocity, f/s: ~~Striking~~ MEAN 1720 Residual
Fuze functioning
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head Was In (EFFECTIVE) (INEFFECTIVE) condition

REMARKS:

Photo No.

Signed
F. W. FISCHER, JR
CHIEF, D.E. 6-5-1-2

CONFIDENTIAL
Security Information

NAVEXOS P-1284 (Rev. 7-51)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 398.89

IMPACT DATE 9-26-51

NPG TEST NO. CODE 11369

OBJECT SENSITIVITY TEST OF XR-51A FUZES IN 5" ROCKET HEADS MK 2 SMOKE PUFF LOADED

Reference: ~~NPG~~ NOL ltr. NP/Na/XI-1(850)OF:GDB 01341 dated 25 July 1951

Reference: ~~BuOrd ltr~~. NPG Project 740 9/1 dated

Task Assignment No. NPG-Re26-11-132 dated 7 August 1951

PLATE TARGET

Gage 1/4 Class M.S.
Maker
No. Group
Dimensions

OBLIQUITY 0°

PENETRATION
Thickness at Impact
No. of impact on plate
Dist. from nearest impact
Dist. from near edge of plate and
Impact area
Spall: Front Back
Dish Spur
Cracks
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge
Through opening

NO MEASUREMENTS

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 2 Mod 2 No. ~~8835~~ Wt. 47.05#
Maker C.S.Co.
Lot No. 38
Filler: Type B.Pic. Wt. 1.0#
Fuzes XR-51A FROM NOL #16
SMOKE PUFF LOADED
Boosters
Wt. of head (as fired) 48.05#

MOTOR: Cal. 5" Mk. 9 Mod 3
Motor temp. 120° WT. 87.80

COMPLETE ROUND: Mark Mod
Wt. (as fired) 135.85#
Wt. (burned)

OTHER INFORMATION MOTORS (2)
GRAIN- MK 16-C
HPC: RMDA-226-H-45
LAUNCHER

ROCKET PERFORMANCE

Flight Velocity, f/s: ~~Striking~~ MEAN 1641 Residual
Fuze functioning
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head was in (EFFECTIVE) (INEFFECTIVE) condition

REMARKS:

Photo No.

Signed
F. W. RADDE, Jr.
Ch. Ex. Br.

CONFIDENTIAL
Security Information

NAVORD FORM 1883 (New 48)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39481

IMPACT DATE 11-27-51

NPG TEST NO. T-2222-1.16

OBJECT SENSITIVITY TEST OF XR-51A FUZES IN 5" ROCKET HEADS MK 6 SMOKE PUFF LOADED

Reference: ~~NPG~~ NOL ltr. NP/NOL/X1-1(850) DF:GDB 01347 dated 28 July 1951
Reference: ~~BuOrd ltr.~~ [illegible] dated
Task Assignment No. NPG-Re26-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 1/2" Class M.S.
Maker
No. Group
Dimensions

OBLIQUITY 0°

PENETRATION COMPLETE
Thickness at impact
No. of impact on plate
Dist. from nearest impact
Dist. from near edges and
Impact area
Spall: Front Back
Dish Spur
Cracks
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge
Through opening

NO MEASUREMENTS

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 6 Mod 1 No. Wt. 48.55
Maker B.W.
Lot No. 12
Filler: Type S. Puff. Wt. 1.25#
Fuzes 4 Vents.
XR-51A NOL #28
Boosters
Wt. of head (as fired) 49.80#

MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 120° Wt. 89.15#

COMPLETE ROUND: Mark Mod
Wt. (as fired) 138.95#
Wt. (burned)

OTHER INFORMATION MOTORS (?)
ALN: RMDA-794-HA-45
GRAIN MK 13-0
LAUNCHER 1050' ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight Velocity, f/s: ~~Striking~~ NEAR 1869 Residual
Fuze functioning NO SMOKE PUFF INDICATED
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head was in (EFFECTIVE) (INEFFECTIVE) condition.

REMARKS:

Photo No.

Signed [illegible]
E. W. [illegible]
ORD. ENG. [illegible]

Impact Record #19

CONFIDENTIAL
Security Information

NAVORD PORM 1883 (Nov 3/

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39482

IMPACT DATE 11-27-51

NPG TEST NO T-232-1.16

OBJECT SENSITIVITY TEST OF XR-51A FUZES IN 5" ROCKET HEADS MK 6 SMOKE PUFF LOADED

Reference: ~~BRG~~ NOL ltr. NP/NOL/X1-K850) DF:GDB 01347 dated 28 July 1951

Reference: ~~BuOrd ltr.~~ dated

Task Assignment No. NPG-Re 26-11-1-32 dated 4 August 1951

PLATE TARGET

Gage 1/4" Class Ord. S.
Maker
No. Group
Dimensions

OBLIQUITY 0°

PENETRATION COMPLETE
Thickness at Impact
No. of impact on plate 15
Dist. from nearest impact
Dist. from near edges and
Impact area
Spall: Front Back
Dish Spur
Cracks NO
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge
Through opening

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 6 Mod 1 No. Wt. 48.85#
Maker E.W.
Lot No. 12
Filler: Type D.PDR. Wt. 1.25#
Fuzes NOL XR.51A #29
Boosters
Wt. of head (as fired) 50.10#

MOTOR: Cal. 5" Mk. 2 Mod 3
Motor temp. 120° WT. 87.50#

COMPLETE ROUND: Mark Mod
Wt. (as fired) 137.60#
Wt. (burned)

OTHER INFORMATION MOTORS (2)
ALN-RMDA-794-HA-45
GRAIN-10K.I.E.C
LAUNCHER 1650' ROCKET LAUNCHER

MEASURE

ROCKET PERFORMANCE

Flight Velocity, f/s: ~~Striking~~ MEAN 1716 Residual
Fuze functioning NO SMOKE PUFF INDICATED
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head was in (EFFECTIVE) (INEFFECTIVE) condition.

REMARKS:

Photo No.

Signed F. W. RASDORF, Lt
ORD. ENG. GS-12

Impact Round # 20

CONFIDENTIAL
Security Information

NAVORD FORM 1883 (New)

IMPACT RECORD

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

IMPACT NO. 39483

IMPACT DATE 11-22-51

NPG TEST NO. T-2222-1.16

OBJECT SENSITIVITY TEST OF XR-51A FUZES IN 5" ROCKET HEADS MK 6 SMOKE PUFF LOADED

Reference: ~~BPG~~NOL ltr. NP(NOL/x1-1(850)DF:GOB 01347 dated 28 July 1951

Reference: ~~BuOrd ltr.~~ NPG Project No. 401 dated

Task Assignment No. NPG-Re2b-11-1-52 dated 4 August 1951

PLATE TARGET

Gage 1/4" Class M.S.
Maker
No. Group
Dimensions

OBLIQUITY 0°

PENETRATION COMPLETE
Thickness at impact
No. of impact on plate
Dist. from nearest impact
Dist. from near edge(s) and
Impact area
Spall: Front NO MEASUREMENTS Back
Dish Spur
Cracks
Punching (thrown) (started)
Back Button (thrown) (started)
Bulge
Through opening

ROCKET

HEAD: Cal. 5" Type SEMI-AP
Mark 6 Mod 1 No. Wt. 48.60#
Maker B. W.
Lot No. 12
Filler: Type B.P.R. Wt. 1.25#
Fuzes 4 VERT.
NOL XR-51A #30
Boosters
Wt. of head (as fired) 49.85#

MOTOR: Cal. 5" Mk. 2 Mod 2
Motor temp. 120° WT. 87.15#

COMPLETE ROUND: Mark Mod
Wt. (as fired) 136.00#
Wt. (burned)

OTHER INFORMATION MOTORS (2)
ALN: BMDB-794-HA-45
GRAIN: MK 18-0
LAUNCHER 105d ROCKET LAUNCHER

ROCKET PERFORMANCE

Flight Velocity, f/s: ~~Striking~~ QUEAN 1906 Residual
Fuze functioning FUZE FUNCTIONED ON WATER IMPACT - 300'
Explosive action (High Order) (Low Order) (None)
Distance of burst behind plate
Condition of recovered round
Head was in (EFFECTIVE) (INEFFECTIVE) condition.

REMARKS:

Photo No.

Signed
F. W. KASDORF, Jr.
C.R.D. E2G1 GS-12

Impact Record #21

CONFIDENTIAL
Security Information

File No.

Butt Firing

U.S. Naval Proving Ground
Dahlgren, Va. 11-28-51 194

IMPACT NO. 39485
IMPACT DATE 11-28-51
BUTT NO. 7

OBJECT Heavy Impact Test of Inert Rocket Fuzes in Modified 6" AP Projectiles Mk 35-5

REFERENCE NOL LETTER NP/NOL/X1-1(850) DF:GDB 01347 DATED 28 July 1951
NPG Report no. 991

PLATE		PROJECTILE	
Gauge	6"0	Caliber	6"0
Class	B	Maker	Midvale
Maker	Carnegie	Type	AP
No.	TT277 Group Proj. Test	Lot No.	139 Year of Specification '43
Contract	Nord-5282	Mark	35 Mod. 5 No. PPL78
Date received	30 August 1944	Date received	
Dimensions	120" x 300"	Capped or ~~uncapped~~	
No. of impact on plate	9	Weight (capped)	131.07#
Thickness at impact	6"13	~~Weight (uncapped)~~	
OBLIQUITY	0°	~~Length (uncapped)~~	
Impact dimensions	11" x 11"	Fuze	NOL XR51-A #19 4140 STEEL
PENETRATION	Complete	Filler	Vermiculite
Flaking front	0	Flight by screen	
Flaking back	0	Condition after firing:-	
Dist. from top, ~~bottom~~	61"	~~EFFECTIVE or~~ INEFFECTIVE	
Dist. from ~~right~~, left	187"	Recovered - Body broken off at top of band & recovered, but fuze left intact	
Dist. from nearest impact	23"		
Dish	0		
Spur	2"		
Cracks - Bulge	0		
Button (Thrown)(~~Started~~)			
Through Opening	6" x 6"		

BALLISTIC DATA

NOTE: All limits are for this plate and this obliquity only.	-1- Desired	-2- Oscillograph Mean	-3- Chronograph	-4- Limit estimated for this thickness of impact	-5- Actual adjusted to nominal gauge	-6- Limit, for nominal gauge, based on this impact only (Adjusted from column 4)	-7- Limit, for nominal gauge, established from this and previous impacts
Striking velocity (f.s.)		2384					

REMARKS Fired with capped windshield
No evidence of band coming off
Powder Charge - SPD 3452 Wt 33.35 lbs.

Limit shots only
e/d
Fte/d.
NPG Photo No.

Acceptance or Rejection recommended
Impact Recorded by F. W. Kasdorf, Jr.
Ord. Eng. GS-12

XXXXXXX
CONFIDENTIAL
Security Information

File No.

Butt Firing

U.S. Naval Proving Ground
Dahlgren, Va. 11-28-51 194

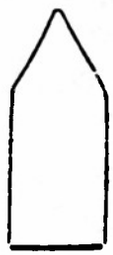
IMPACT No. 39486
IMPACT DATE 11-28-51
BUTT No. 7

OBJECT Heavy Impact Test of Inert Rocket Fuzes in Modified 6" AP Projectiles Mk 35-5

REFERENCE NOL LETTER NP/NOL/X1-1(850)DF:GOB 01347 DATED 28 July 1951

B.P.G. Report No. 971

PLATE		PROJECTILE	
Gauge	6"0	Caliber	6"0
Class	B	Maker	Midvale
Maker	Carnegie	Type	AP
No.	TT277 Group Proj. Test	Lot No.	139 Year of Specification '43
Contract	Nord-5282	Mark	35 Mod. 5 No. LR115
Date received	30 August 1944	Date received	
Dimensions	120" x 300"	Capped or ~~uncapped~~	
No. of impact on plate	10	Weight (capped)	131.14#
Thickness at impact	6"13	~~Weight (uncapped)~~	
OBLIQUITY	0°	~~Length (uncapped)~~	
Impact dimensions	10" x 11"	Fuze	NOL Inert #20 - 4140 STEEL
PENETRATION	Complete	Filler	Vermiculite
Flaking front	0	Flight by screen	
Flaking back	0	Condition after firing:-	
Dist. from top, ~~bottom~~	82"	EFFECTIVE or ~~INEFFECTIVE~~	
Dist. from ~~right~~, left	182"	Intact	
Dist. from nearest impact	21"	Recovered	
Dish	0		
Spur	2"		
Cracks - Bulge	0		
Button (Thrown)(~~Started~~)			
Through Opening	5-3/4" x 6"		



BALLISTIC DATA

NOTE: All limits are for this plate and this obliquity only.	-1- Derived	-2- Oscillograph Mean	-3- Chronograph	-4- Limit, estimated for this thickness of impact.	-5- Actual adjusted to nominal gauge.	-6- Limit, for nominal gauge, based on this impact only. (Adjusted from column 4)	-7- Limit, for nominal gauge, established from columns 5 and previous impacts.
Striking velocity (f.s.)		2448					

REMARKS
No evidence of band coming off
Powder Charge SPN 3452 - 33.85#

Limit shots only
e/d
F(e/d, Θ)
N.P.G. Photo. No.

Impact Rec'd #23

Acceptance or Rejection recommended
F. W. Kasdorf, Jr.
Crd. Eng. GS-12 U.S. Navy

Gun: 6"25 Smoothbore Mk. 10-0 #1198

CONFIDENTIAL
Security Information

File No.

Butt Firing

U.S. Naval Proving Ground
Dahlgren, Va. 11-28-51 194

IMPACT NO. 39487
IMPACT DATE 11-28-51
BUTT NO. 7

OBJECT Heavy Impact Test of Inert Rocket Fuzes in Modified 6" AP Projectiles Mk 35-5

REFERENCE NOL LETTER NP/NOL/X11(52)NF:GDB 01347 DATED 28 July 1951

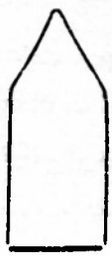
NPG Report 2[illegible]/51

PLATE

Gauge 6".0
Class B
Maker Carnegie
No. TT277 Group Proj. Test
Contract Nord-5282
Date received 30 August 1944
Dimensions 120" x 300"
No. of impact on plate 11
Thickness at impact 6".13
OBLIQUITY 0°
Impact dimensions 10" x 10"
PENETRATION Complete
Flaking front 0
Flaking back 0
Dist. from top, ~~bottom~~ x 44"
Dist. from ~~right~~, left 183"
Dist. from nearest impact 17"
Dish 0
Spur 2"
Cracks - Bulge 0
Button (Thrown)(~~Started~~)
Through Opening 6" x 6"

PROJECTILE

Caliber 6".0
Maker Midvale
Type AP
Lot No. 139 Year of Specification '43
Mark 35 Mod. 5 No. LT328
Date received
Capped or ~~uncapped~~
Weight (capped) 131.50#
~~Weight (uncapped)~~
~~Length (uncapped)~~
Fuze NOL 5 Ex-108 #1
Filler Vermiculite
Flight by screen
Condition after firing:-
EFFECTIVE ~~or INEFFECTIVE~~
- Intact
Recovered



BALLISTIC DATA

NOTE: All limits are for this plate and this obliquity only.	-1- Desired	-2- Oscillograph Mean	-3- Chronograph	-4- Limit, estimated for the thickness of impact	-5- Actual attained [illegible]	-6- Limit, for nominal gauge, based on this impact only (Adjusted from column 4)	-7- Limit, for nominal gauge, established from column 6 and previous impacts
Striking velocity (f.s.)		2233					

REMARKS
No evidence of band coming off

Limit shots only
e/d
P(e/d, e)
N.P.G. Photo No.

Acceptance or Rejection recommended
Impact Res. Lt. [illegible]
F. W. Kusdorf, Jr.
Ord. Eng. GS-12

Gun: 6".25 Smoothbore Mk 1-0 #1198

~~CONFIDENTIAL~~
~~Security Information~~

File No.

Butt Firing

U. S. Naval Proving Ground

Dahlgren, Va. 11-28-51 194

IMPACT NO. 39488

IMPACT DATE 11-28-51

BUTT NO. 7

OBJECT Heavy Impact Test of Inert Rocket Fuzes in Modified 6" AP Projectiles Mk 35-5

REFERENCE NOL LETTER NP/ldc/fx-1(850)DF:GOB 01347 DATED 28 July 1951

PIPS Report No. 971

PLATE

Gauge 6"0
Class B
Maker Carnegie
No. TT277 Group Proj. Test
Contract Nord-5282
Date received 30 August 1944
Dimensions 120" x 300"
No. of impact on plate 12
Thickness at impact 6"13
OBLIQUITY 0°
Impact dimensions 9-1/2" x 10-1/2"
PENETRATION Complete
Flaking front 0
Flaking back 0
Dist. from top, ~~bottom~~ 50"
Dist. from ~~right~~, left 157"
Dist. from nearest impact 15"
Dish 0
Spur 2"
Cracks - Bulge 0
Button (Thrown)(~~Started~~)
Through Opening 6"x 6-1/4"

PROJECTILE

Caliber 6"0
Maker Midvale
Type AP
Lot No. 139 Year of Specification '43
Mark 35 Mod. 5 No. MMU446
Date received
Capped or ~~uncapped~~
Weight (capped) 130.63#
~~Weight (uncapped)~~
~~Length (uncapped)~~
Fuze NOL Ex-108 #2
Filler Vermiculite
Flight by screen
Condition after firing:-
EFFECTIVE ~~or INEFFECTIVE~~
Intact
Recovered

BALLISTIC DATA

NOTE: All limits are for this plate and this obliquity only.	-1- Desired	-2- Oscillograph Mean	-3- Chronograph	-4- Limit, estimated for this thickness of impact.	-5- Actual, adjusted to nominal gauge.	-6- Limit, for nominal gauge, based on this impact only. (Adjusted from column 4)	-7- Limit, for nominal gauge, established from column 6 and previous impacts.
Striking velocity (f.s.)		None					

REMARKS Fired with expanding rod band.
No evidence of band coming off

Limit shots only

e/d

F(e/d, θ)

N.P.G. Photo. No.

Impact Record #25

Acceptance or Rejection recommended

F. W. Kasdorf

F. W. Kasdorf, lh
Ord. Eng. GS-12

Gun: 6"25 Smoothbore Mk 16-0 #1198

CONFIDENTIAL
Security Information

File No.

Butt Firing

U. S. Naval Proving Ground
Dahlgren, Va. 11-29-51 194

IMPACT No. 39496
IMPACT DATE 11-29-51
BUTT No. 7

OBJECT Heavy Impact Test of Inert Rocket Fuzes in Modified 6" AP Proje. Mk 35-5

REFERENCE NOL LETTER NP/NOL/XR-1(150) DF:GOB 01347 DATED 28 July 1951

Ord & Report No. 9[illegible]

PLATE

Gauge 4"0
Class B
Maker Carnegie
No. TT205 Group Proj. Test
Contract Nord-5282
Date received 14 August 1944
Dimensions 120" x 300"
No. of impact on plate 10
Thickness at impact 4"13
OBLIQUITY 0°
Impact dimensions 8" x 8"
PENETRATION Complete
Flaking front 0
Flaking back 0
Dist. from top, ~~bottom~~ 67"
Dist. from ~~right~~, left 187"
Dist. from nearest impact 23"
Dish 0
Spur 4"
Cracks - Bulge 0
Button (Thrown)(~~Started~~)
Through Opening 6-3/4" x 7"

PROJECTILE

Caliber 6"0
Maker Midvale
Type AP
Lot No. 139 Year of Specification '43
Mark 35 Mod. 5 No. JJP94
Date received
Capped or ~~uncapped~~
Weight (~~capped~~) 102.31#
~~Weight (uncapped)~~
~~Length (uncapped)~~
Fuze NOL XR51A #21 - 4140 STEEL
Filler Vermiculite
Flight by screen
Condition after firing:-
EFFECTIVE ~~or INEFFECTIVE~~
- nose clean cut off
Recovered

BALLISTIC DATA

NOTE: All limits are for this plate and this obliquity only.	-1- Desired	-2- Oscillograph Mean	-3 Chronograph	-4- Limit, estimated for this thickness of impact	-5 Actual adjusted to nominal charge.	-6- Limit for nominal charge based on this impact only (Adjusted from column 4)	-7- Limit, for nominal charge, established from column 6 and previous impacts
Striking velocity (f.s.)		1918					

REMARKS
Capped Windshield removed

Limit shots only
c/d
F(c/d, ~~s~~)
N.P.G. Photo. No.

Acceptance or Rejection recommended
F. W. Kasdorf
F. W. Kasdorf, Jr.
Ord. Eng. GS-12

Impact Record #26

Gun: 6"25 Smoothbore Mk 16-0 #1198

~~CONFIDENTIAL~~
Security Information

File No.

Butt Firing

U.S. Naval Proving Ground
Dahlgren, Va. 11-29-51

Impact No. 39497
Impact Date 11-29-51
Butt No. 7

Object Heavy Impact Test of Inert Rocket Fuzes in Modified 6" AP Projs. Mk 35-5

Reference NOL Letter NP/NOL/X1-1(850) DF:GD3 01347 dated 28 July 1951

BuPS Project No. 9721

PLATE

Gauge 4"0
Class B
Maker Carnegie
No. TT205 Group Proj. Test
Contract Nord-5282
Date received 14 August 1944
Dimensions 120" x 300"
No. of impact on plate 11
Thickness at impact 4"0
OBLIQUITY 0°
Impact dimensions 8" x 8"
PENETRATION Complete
Flaking front 0
Flaking back 0
Dist. from top, ~~bottom~~ 87"
Dist. from ~~right~~, left 184"
Dist. from nearest impact 20"
Dish 0
Spur 4"
Cracks - Bulge 0
Button (Thrown)(~~Started~~)
Through Opening 6-3/4" x 7"

PROJECTILE

Caliber 6"0
Maker Midvale
Type AP
Lot No. 139 Year of Specification '43
Mark 35 Mod. 5 No. MMT200
Date received -
Capped ~~or uncapped~~
Weight (~~capped~~) 102.15#
~~Weight (uncapped)~~
~~Length (uncapped)~~
Fuze NOL XR-51A #22 - 4140 STEEL
Filler Vermiculite
Flight by screen
Condition after firing:-
EFFECTIVE ~~or INEFFECTIVE~~
- Rosecheweloff
Recovered

BALLISTIC DATA

Note: All limits are for this plate and this obliquity only.	-1- Desired	-2- Oscillograph Mean	-3- Chronograph	-4- Limit, estimated for this thickness of impact.	-5 Actual adjusted to nominal gauge	-6- Limit, for nominal gauge, based on this impact only. (Adjusted from column 4)	-7- Limit, for nominal gauge, established from column 6 and previous impacts.
Striking velocity (f.s.)		1992					

Remarks
Cap and Windshield removed

Limit shots only
e/d
F(e/d, 6)
N.P.G. Photo. No.

Acceptance or Rejection recommended
F. W. Kasdorf
F. W. Kasdorf, lh

Impact Round #27 Ord. Eng. G. S.-12 ~~U.S. Navy~~

Gun: 6"25 Smoothbore Mk 16-0 #1198

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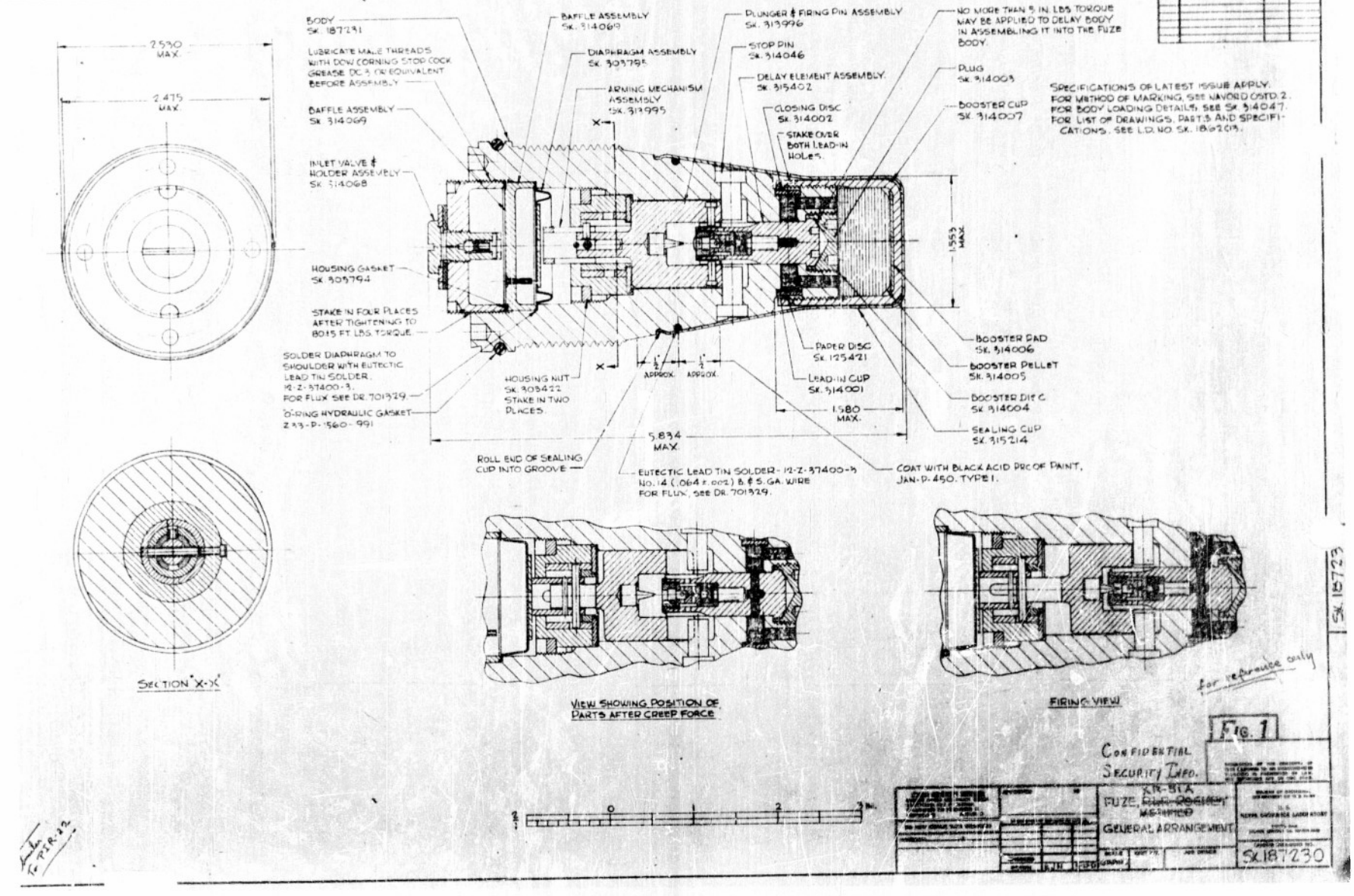
NPG. 48605


2.530 MAX.
2.475 MAX.
BODY SK. 187231
LUBRICATE MALE THREADS WITH DOW CORNING STOP COCK GREASE DC 3 OR EQUIVALENT BEFORE ASSEMBLY
BAFFLE ASSEMBLY SK. 314069
INLET VALVE & HOLDER ASSEMBLY SK. 314068
HOUSING GASKET SK. 305794
STAKE IN FOUR PLACES AFTER TIGHTENING TO 80±5 FT. LBS. TORQUE
SOLDER DIAPHRAGM TO SHOULDER WITH EUTECTIC LEAD TIN SOLDER, 12-Z-37400-3. FOR FLUX SEE DR. 701329.
O-RING HYDRAULIC GASKET Z 33-P-1560-991
BAFFLE ASSEMBLY SK. 314069
DIAPHRAGM ASSEMBLY SK. 305795
ARMING MECHANISM ASSEMBLY SK. 313995
PLUNGER & FIRING PIN ASSEMBLY SK. 313996
STOP PIN SK. 314046
DELAY ELEMENT ASSEMBLY SK. 315402
CLOSING DISC SK. 314002
STAKE OVER BOTH LEAD-IN HOLES.
NO MORE THAN 5 IN. LBS TORQUE MAY BE APPLIED TO DELAY BODY IN ASSEMBLING IT INTO THE FUZE BODY.
PLUG SK. 314003
BOOSTER CUP SK. 314007
SPECIFICATIONS OF LATEST ISSUE APPLY. FOR METHOD OF MARKING, SEE NAVORD OSTD. 2. FOR BODY LOADING DETAILS SEE SK. 314047. FOR LIST OF DRAWINGS, PARTS AND SPECIFICATIONS, SEE L.D. NO. SK. 186203.
1.553 MAX.
HOUSING NUT SK. 305422 STAKE IN TWO PLACES.
1/2 APPROX.
1/2 APPROX.
PAPER DISC SK. 125421
LEAD-IN CUP SK. 314001
1.580 MAX.
5.834 MAX.
BOOSTER PAD SK. 314006
BOOSTER PELLET SK. 314005
BOOSTER DISC SK. 314004
SEALING CUP SK. 315214
ROLL END OF SEALING CUP INTO GROOVE
EUTECTIC LEAD TIN SOLDER - 12-Z-37400-5 No. 14 (.064 ± .002) B & S. GA. WIRE FOR FLUX, SEE DR. 701329.
COAT WITH BLACK ACID PROOF PAINT, JAN-P-450, TYPE I.
SECTION "X-X"
VIEW SHOWING POSITION OF PARTS AFTER CREEP FORCE
FIRING VIEW
0 1 2 3 IN.
CONFIDENTIAL SECURITY INFO.
FUZE, XR-91A MECHANICAL GENERAL ARRANGEMENT
SK. 187230
SK. 187229
for reference only
FIG. 1

31 August 1951

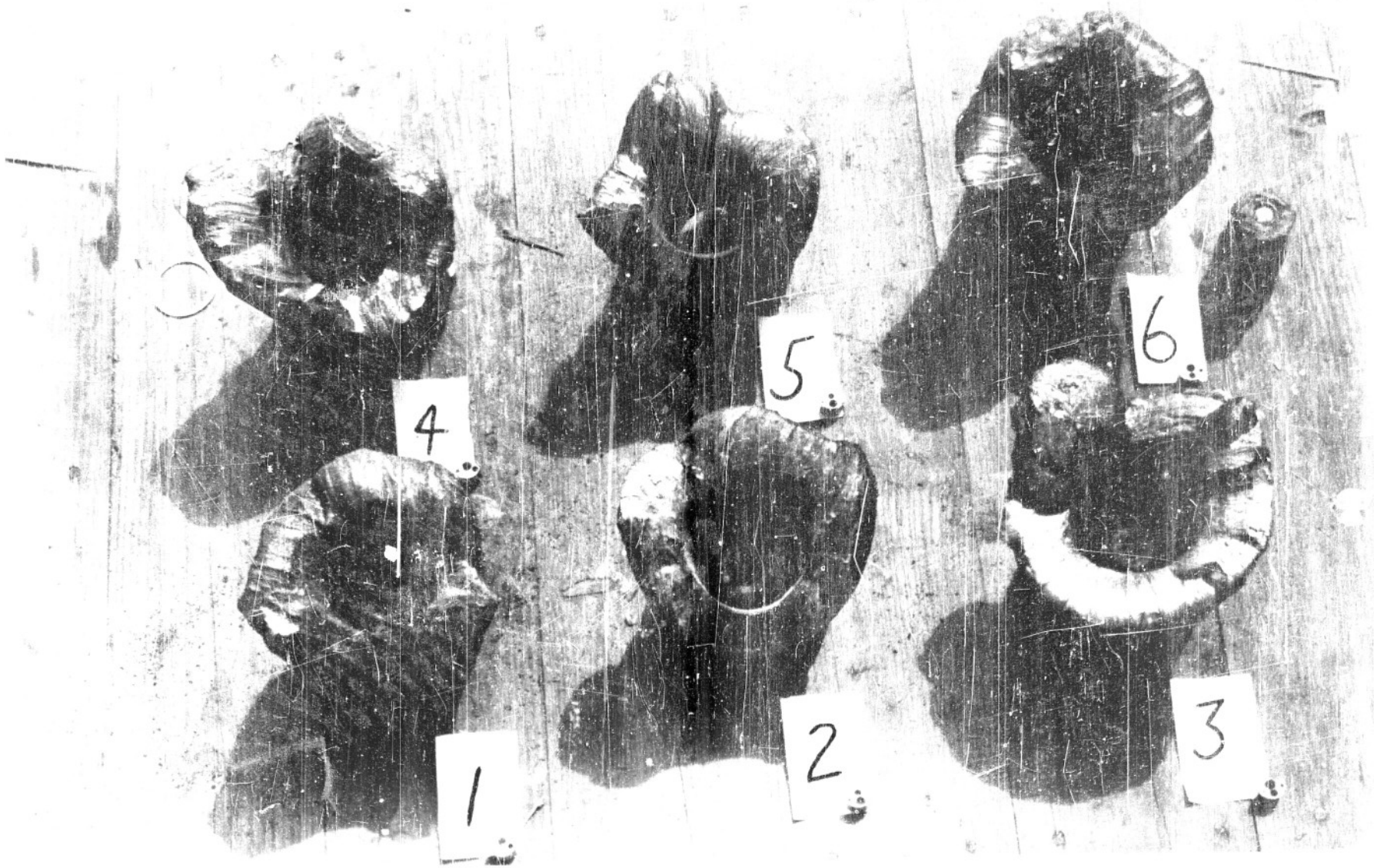
NP9-48605

Heavy impact test of XR-51A fuze fired from 6".25 smooth bore gun in 6" AP modified projectile.
View: 6" AP projectile MK 35 Mod 5 as modified for firing from 6".25 smooth bore gun, built up with steel bands fore and aft windshield and cap removed. Note XR-51A fuze installed in base.

Figure 2

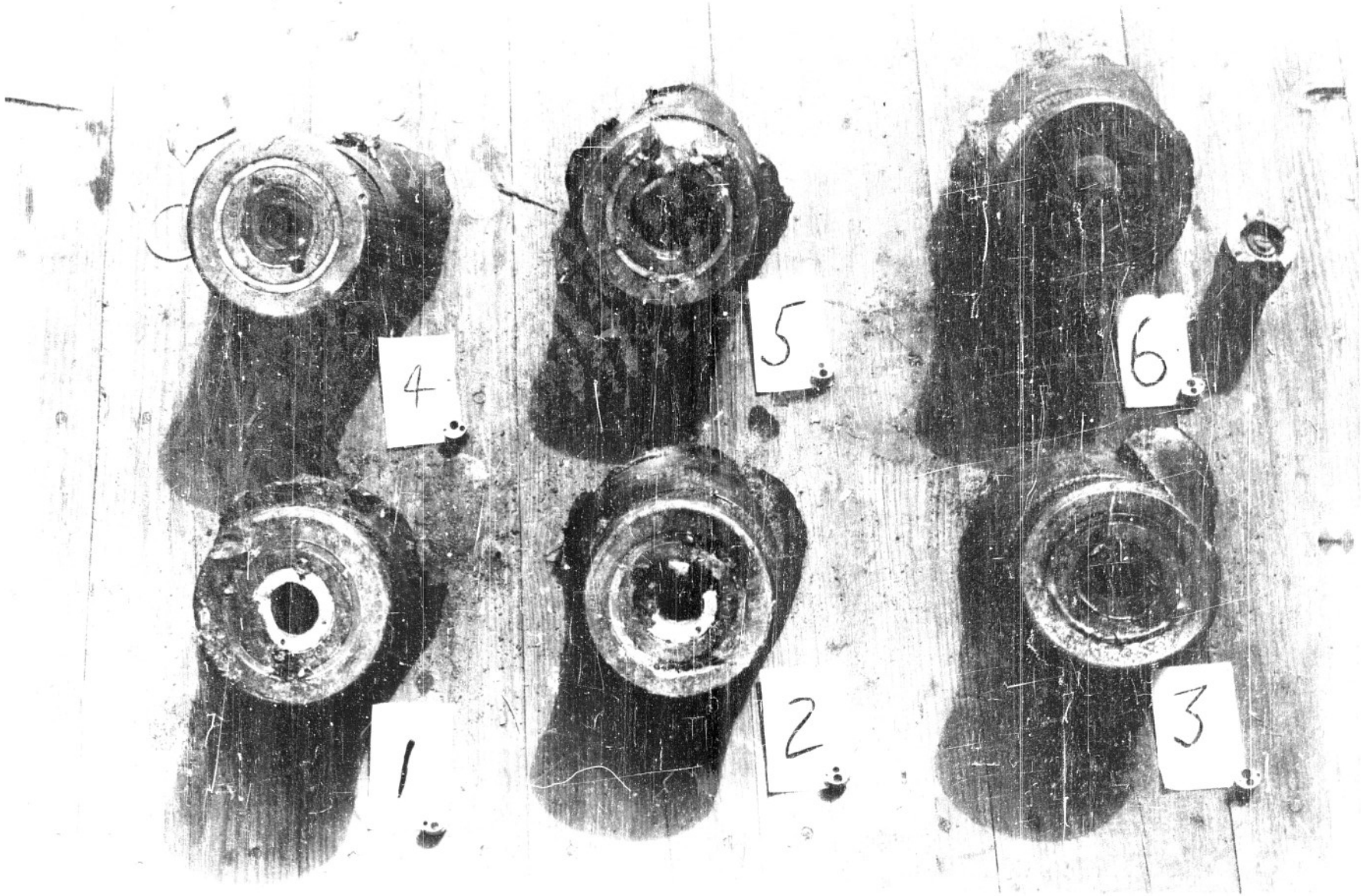
NP9-46058 Figure 3 5 September 1951 CONFIDENTIAL

Heavy plate test of XR-51A Rocket Fuze. Fuzes tested in modified 6" AP projectiles (minus cap and windshield) fired from 6"/25 smooth bore gun over 50 ft. range. View shows interior of shell and remains of fuze. (Over, please)



NP9-46059 Figure 4 5 September 1951 CONFIDENTIAL

Heavy plate test of XR-51A Rocket Fuze. Fuze tested in modified 6" AP projectiles (minus cap and windshield) fired from 6"/25 smooth bore gun over 50 ft. range. View shows base end of projectiles and fuze recovered from round 6. (Over, please)



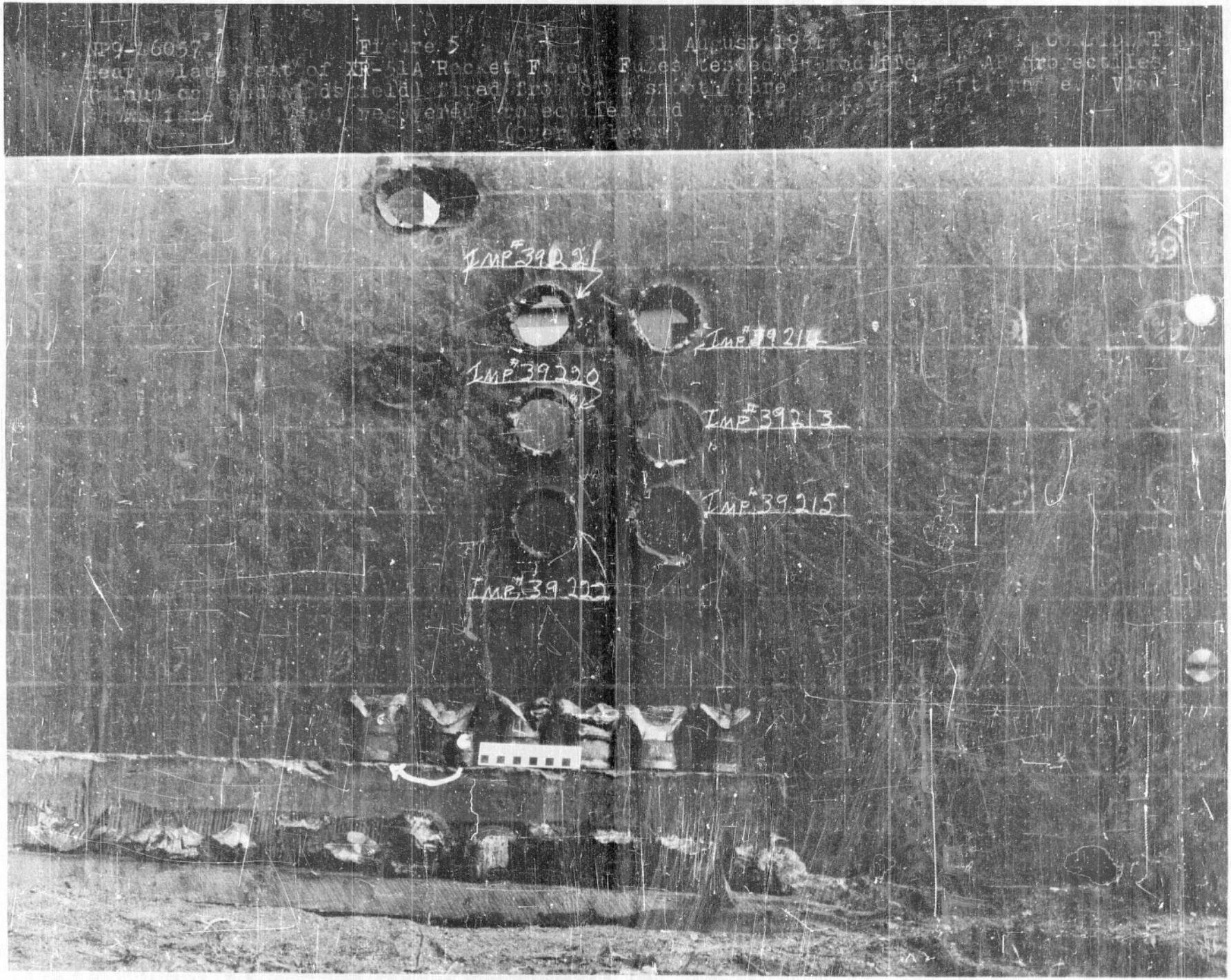


Figure 5

AP9-26057

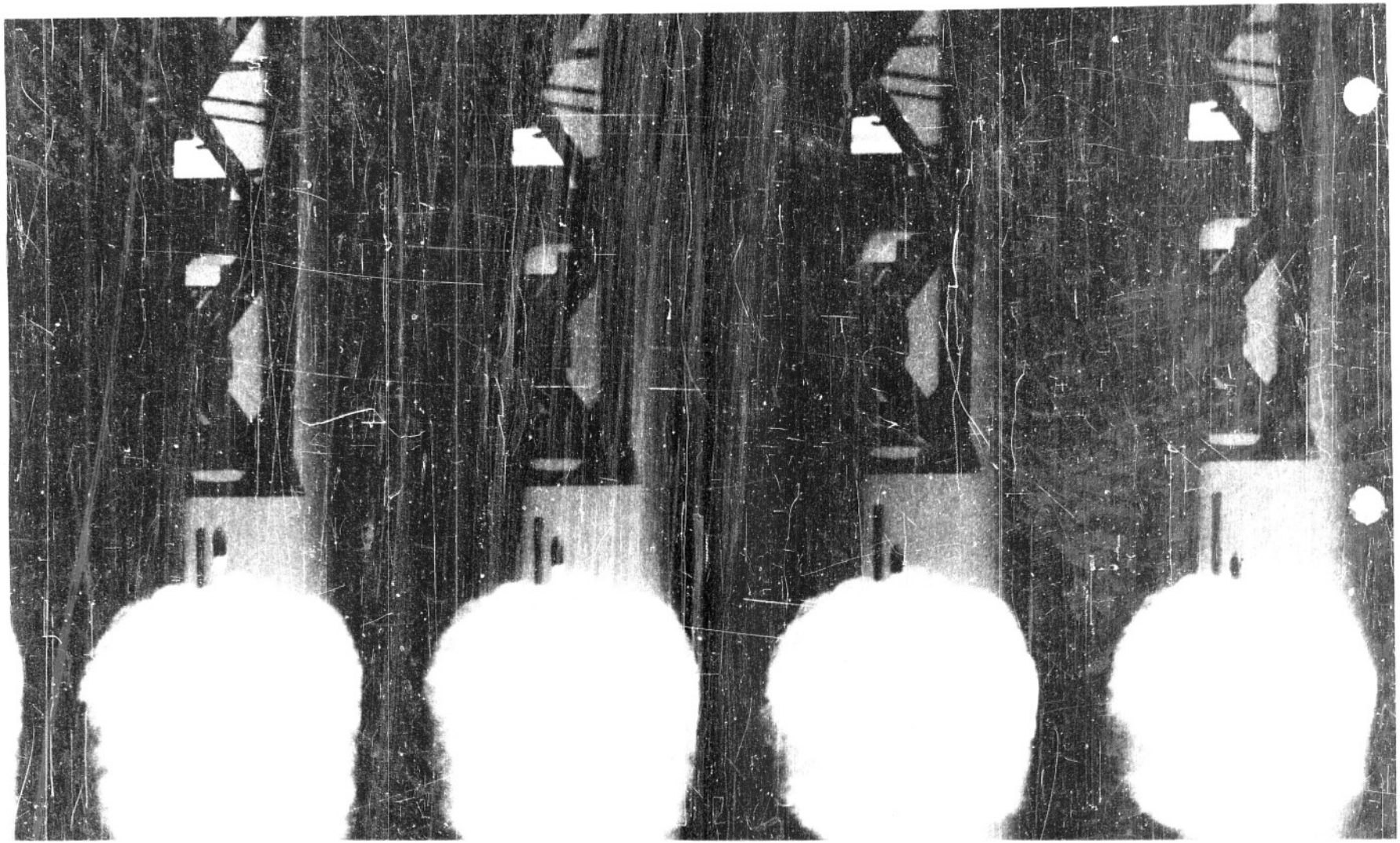
31 August 19[illegible]

Rear plate test of XM-51A Rocket Fuzes. Fuzes tested [illegible] AP projectiles, 6-inch caliber and [illegible] fired from [illegible] smooth bore [illegible] over [illegible] feet. Velocity [illegible] feet per second. Projectile and [illegible]

(over)

NP9-48608 Date Fired: 31 August 1951
Heavy plate test of XR-51A rocket fuze. Fuzes tested in modified 6" AP projectiles (minus cap and windshield) fired from 6"25 smooth bore gun over 50 ft. range. View: Projectile in flight at 2800 ft/sec.

Figure 6



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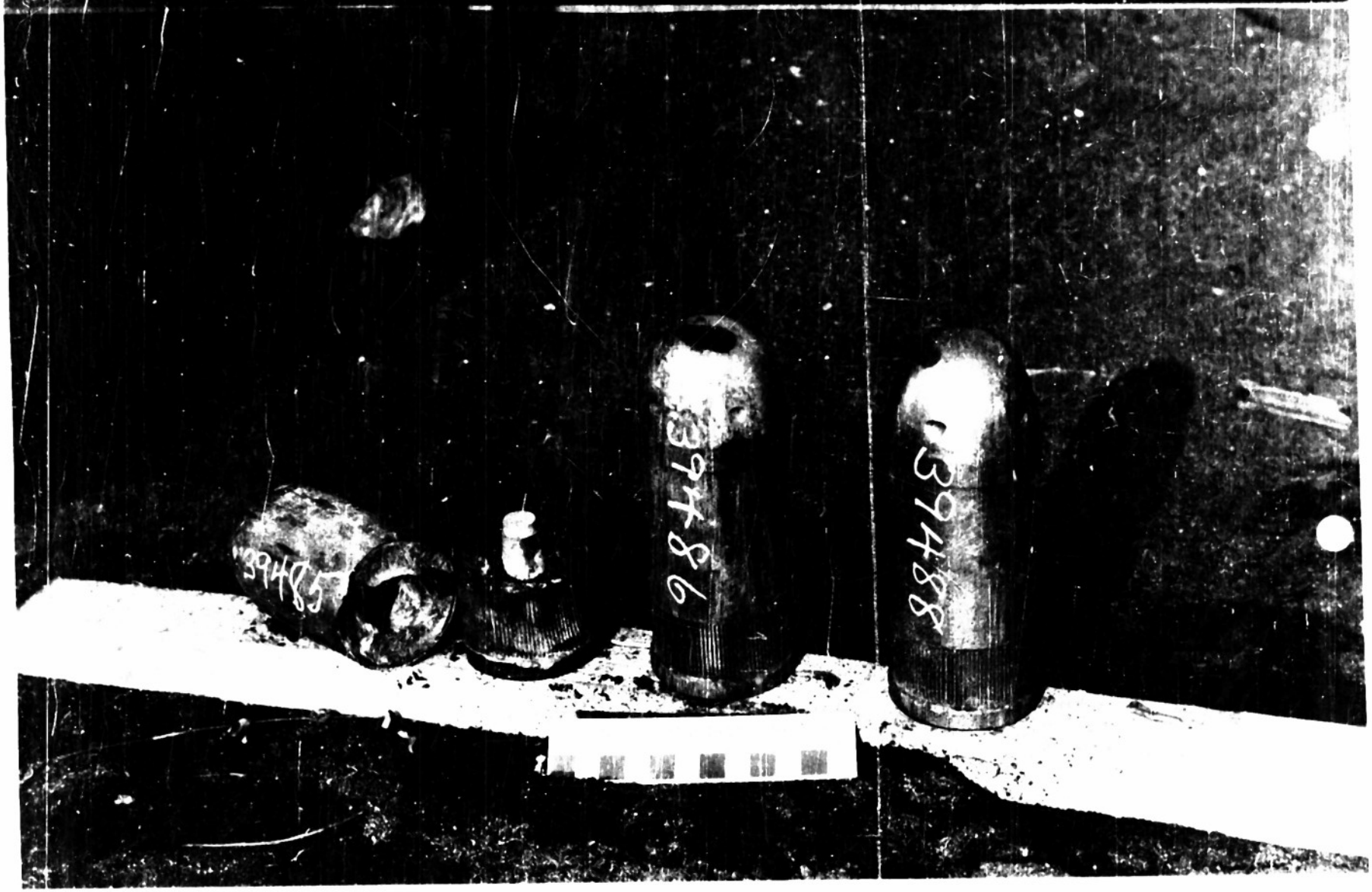
SECURITY INFORMATION

NPG-48604

Figure 7

Heavy impact test of XR-51-A and EX-108 fuzes in 6" AP (modified) projectile Mk 35 Mod 5. Fired from 6"25 smooth bore gun over 50 ft. range. View: Recovered Projectiles

(over please)



CONFIDENTIAL
SECURITY INFORMATION

NP9-48603

Figure 8

Heavy Impact Test of XR-51A and EX-108 fuzes in 6" AP (modified) projectiles Mk 35 Mod 5. Fired from 6"25 smooth bore gun over 50 ft. range. View: Recovered projectiles

(over please)

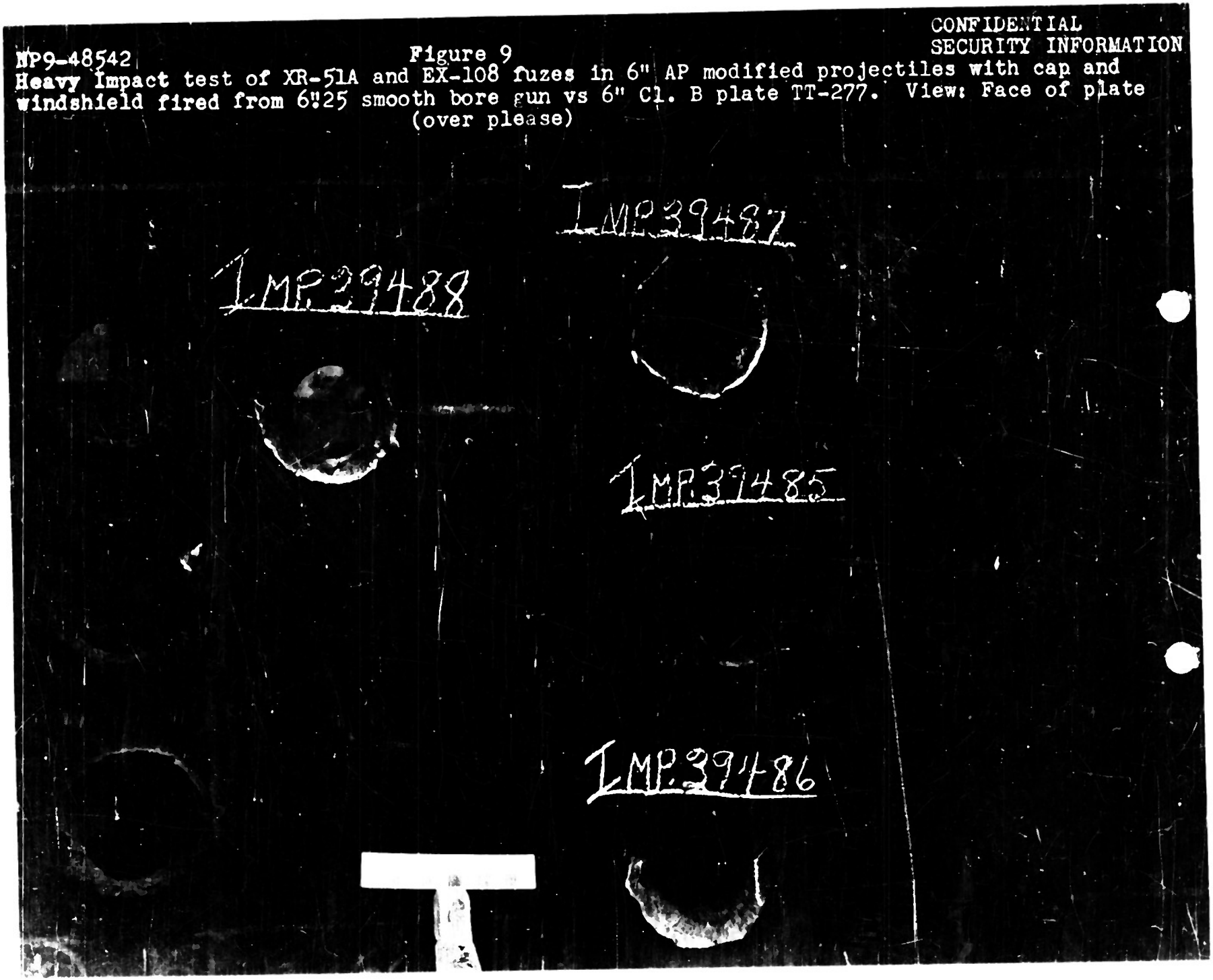
CONFIDENTIAL
SECURITY INFORMATION

NP9-48542

Figure 9

Heavy Impact test of XR-51A and EX-108 fuzes in 6" AP modified projectiles with cap and windshield fired from 6"25 smooth bore gun vs 6" Cl. B plate TT-277. View: Face of plate

(over please)



NP9-48541

Figure 10

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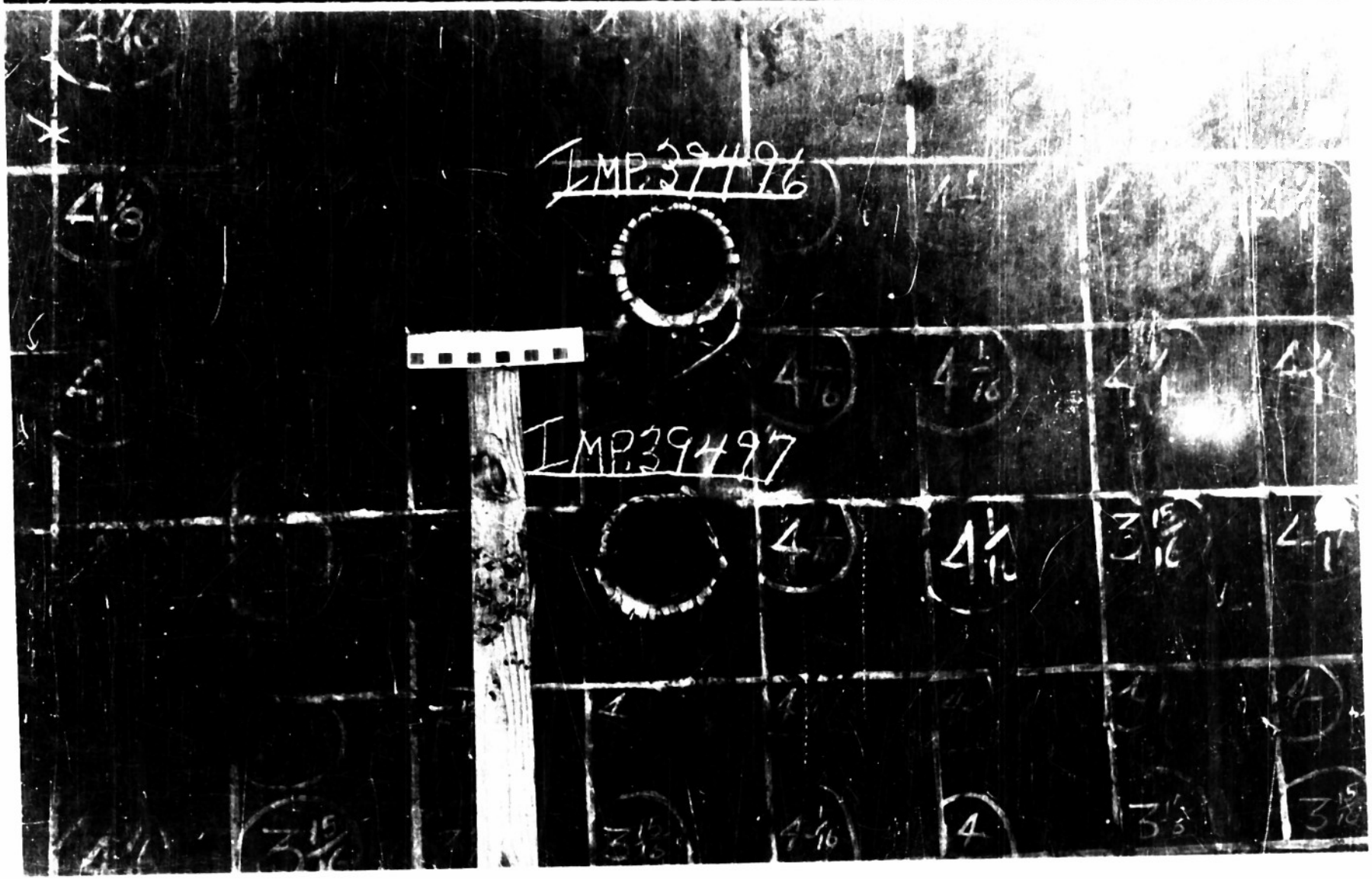
Heavy Impact Test of XR-51A fuzes in 6" AP modified projectiles (cap and windshield removed) fired from 6"25 smooth bore gun vs 4" Cl. B plate TT-205. View: Face of plate

(over please)



NPG-48607

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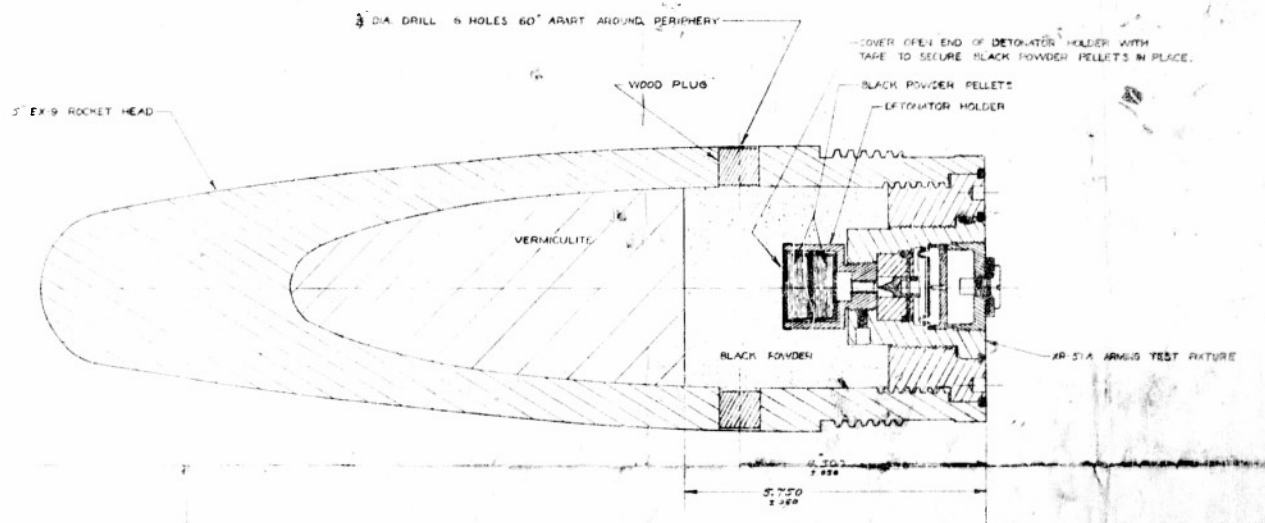

LOADING DETAILS FOR BLACK POWDER

1. SCREW XR-51 ARMING TEST FIXTURE INTO PLACE AND GAS CHECK.
2. PLUG 5 HOLES WITH WOOD PLUGS.
3. FILL CAVITY WITH FIFS BLACK POWDER THROUGH 6TH HOLE.
4. CLEAN TRACES OF BLACK POWDER FROM HOLE.
5. PLUG HOLE (WOOD PLUG).

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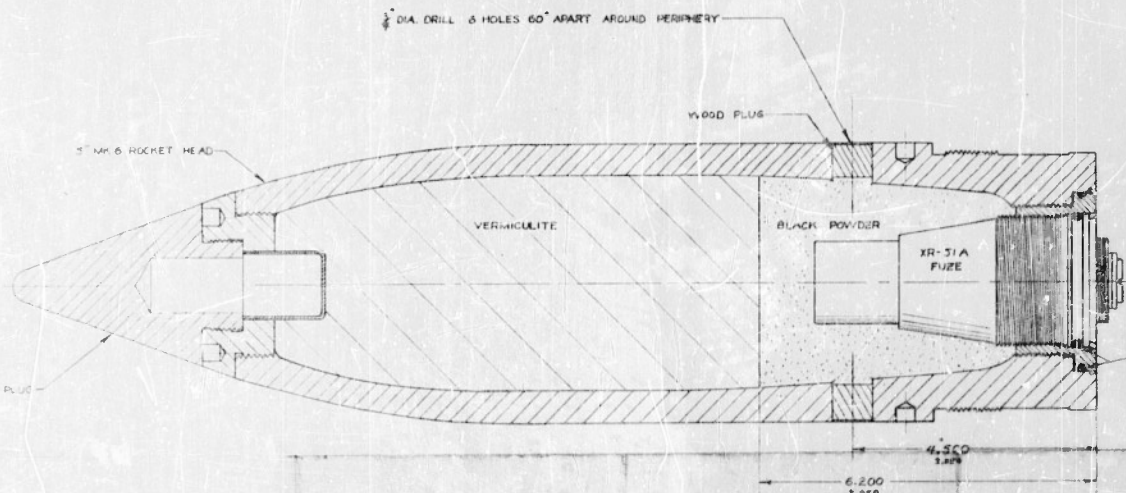
XR-51A FUZE ARMING FIXTURE ASSEMBLED 5 EX9 ROCKET HEAD MODIFIED FOR SHAKE TEST

311379

NPG 46488



LOADING DETAILS FOR BLACK POWDER

1. SCREW FUZE INTO PLACE.
2. PLUG 5 HOLES WITH WOOD PLUGS.
3. FILL CAVITY WITH FFFG BLACK POWDER THROUGH 6TH HOLE.
4. CLEAN TRACES OF BLACK POWDER FROM HOLE.
5. PLUG HOLE (WOOD PLUG).

Figure 12

NPG REPORT NO. 971

Aircraft Rocket Fuses; XR-51A, XR-8D, and EX-108;
Development of

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Development of

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